

THE MEXICAN AND CENTRAL AMERICAN SPECIES OF *FUCHSIA* (ONAGRACEAE) EXCEPT FOR SECT. *ENCLIANDRA*¹

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ABSTRACT

Six native and one naturalized species of *Fuchsia* (Onagraceae) from Mexico and Central America are recognized, not including the recently revised sect. *Encliandra*. One species, *Fuchsia jimenezii*, and one section, *Jimenezia*, are newly described, and *Ellobium* is also recognized as a section. The recognition of subdioecy in *Fuchsia paniculata* (sect. *Schufia*) now strengthens evidence of a trend toward male sterility and eventual dioecy in the small, peripheral sections of the genus. The distinctions between that species and the closely related but entirely hermaphroditic *F. arborescens* are established. *Fuchsia jimenezii* (sect. *Jimenezia*) is a phylogenetically key species because it has the antipetalous stamens reflexed into the tube like sect. *Encliandra*, yet it has the more generalized many-seeded berry and hermaphroditic flowers of most other sections. The new sect. *Ellobium* joins *F. splendens*, *F. fulgens*, and *F. decidua* into a morphologically and geographically coherent unit, with links to the Andean sects. *Fuchsia* and *Hemsleyella*. *Fuchsia cordifolia* is reduced to the synonymy of *F. splendens* on the basis of a study of populations from throughout its range.

Fuchsia is a predominantly South American group comprising some 100 species of shrubs and trees. In the only comprehensive revision of the genus, Munz (1943) recognized seven sections, *Quelusia*, *Fuchsia*, *Hemsleyella*, *Kiershlegeria*, *Schufia*, *Encliandra*, and *Skinnera*, of which the last three, a small part of sect. *Fuchsia*, and one species of *Hemsleyella* were found outside of South America. Recently, Breedlove (1969) revised the Mexican and Central American sect. *Encliandra*, reducing the number of species recognized from 16 to 6 through the study of populations in the field. Later, experimental work by Arroyo & Raven (1975) revealed that the three morphologically gynodioecious species in this section are functionally subdioecious and that the remaining morphologically dioecious species probably evolved from gynodioecious ancestors via subdioecy. As a result of the senior author's extensive field experience in the area, the examination of numerous specimens, and especially the finding in Central America of sexually dimorphic populations in sect. *Schufia*, there was good reason to revise critically the remaining species of the genus in Mexico and Central America.

Outside of sect. *Encliandra*, we here recognize six species of *Fuchsia* in three sections, all of which are endemic to Mexico and Central America. Two of these sections, *Ellobium* and *Jimenezia*, are newly recognized in this paper. Section *Ellobium* comprises three species, *F. splendens* (including *F. cordifolia*), *F. fulgens*, and *F. decidua*. The first two species were placed by Munz in the large

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sect. *Fuchsia*, while *F. decidua* was placed with other tuberous shrubs and epiphytes in sect. *Hemsleyella*. With the present change, *Hemsleyella* now consists entirely of apetalous species that are confined to the South American Andes. Likewise, sect. *Fuchsia* is now restricted in its native range to the Andes except for two species that are endemic on the island of Hispaniola.

Fuchsia jimenezii, the only member of sect. *Jimenezia*, is newly described from Panama and Costa Rica. It is the only member in the genus outside of sect. *Encliandra* that has the antipetalous stamens reflexed and included in the floral tube. It differs strongly from *Encliandra*, however, in its hermaphroditic flowers in a terminal inflorescence and in its more generalized many-seeded fruits. The stamen character is clearly apomorphic and indicates that sect. *Jimenezia* is the sister group of the generally more specialized sect. *Encliandra*.

The presence and distribution of male sterility was not fully recognized in sect. *Schufia* until now. *Fuchsia arborescens* is entirely hermaphroditic and is confined to the area north of the Isthmus of Tehuantepec. In contrast, the Mexican and Central American *F. paniculata* has hermaphroditic populations north of the Isthmus and morphologically gynodioecious but functionally subdioecious populations from Chiapas, Mexico, to Panama. The discovery of subdioecy in sect. *Schufia* is significant in view of the fact that three other geographically peripheral sections of *Fuchsia*, namely *Encliandra* (six species; Mexico and Central America), *Skinnera* (four species; New Zealand and Tahiti), and *Kierschlegeria* (one species; dry, coastal Chile), are characterized by male sterility in all but one species of sect. *Skinnera* (Arroyo & Raven, 1975). All of the New World species and one species in New Zealand are dioecious or subdioecious; the remaining two New Zealand species are gynodioecious. These constitute the only known cases of male sterility in Onagraceae (Raven, 1979). *Fuchsia paniculata* is noteworthy in being the only species in the genus to include both hermaphroditic and sexually dimorphic populations. Since hermaphroditic individuals of *F. paniculata* give rise to both pistillate and perfect-flowered individuals, the genetic control of male sterility in sect. *Schufia* is unlike that of sect. *Encliandra*, where it is apparently controlled by a dominant gene (Arroyo & Raven, 1975). It may be more similar to the kind of male sterility found in the distantly related sect. *Skinnera*, where it is controlled by a recessive gene (E. Godley & P. Raven, pers. comm.).

In addition to the native species, one commonly cultivated and naturalized species native to South America, *Fuchsia boliviana*, is included in this treatment. Since its relationships lie mainly outside of the area considered in this paper, its complete synonymy is not presented here (see Berry, this number, pp. 162–163).

HISTORY OF CULTIVATION

All the Mexican and Central American species treated here, except *Fuchsia decidua* and *F. jimenezii*, were brought into cultivation in the past century. George Bullock first introduced *F. arborescens* into Europe in 1823 from seeds he obtained in the botanical garden in Mexico City (Bullock, 1824). It is quite likely that these same plants were originally collected by Martín Sessé, an early collector of the Mexican flora and founder of the botanical garden in 1787 (McVaugh,

1977); Sessé's own name for this species, *Fuchsia arborea*, was validly published only in 1888.

Fuchsia fulgens arrived in Europe in the 1830s, probably first introduced by Theodor Hartweg from Mexico in 1836. *Fuchsia splendens* reached Europe in 1840 from Guatemala under the name *F. cordifolia*, again through the remarkable collecting efforts of Hartweg, who sent more seeds of this species the following year from southern Mexico. Both of these species were purportedly involved in many of the early hybridizations with strains of *F. magellanica* Lam. from South America (see Harrison, 1841; Hemsley, 1876), possibly playing a role in the origin of the commonly cultivated garden hybrids now grouped under the name *F. hybrida* Hort.

The first record of *F. paniculata* in cultivation was in 1847 by the Van Houtte nurseries in France, from seeds sent from Guatemala. This species is now widely cultivated in parks and botanical gardens throughout the world, whereas its close relative *F. arborescens* is not found frequently in cultivation today. *Fuchsia paniculata* has apparently become naturalized in Sri Lanka, Tanzania, and Hawaii. In addition, Standley & Williams (1963, p. 530) stated that it was widely cultivated for ornament in Guatemala, especially in the central highlands around Cobán, where panicles of flowers were often sold in markets.

For a long time *Fuchsia boliviana* was incorrectly called *F. corymbiflora* and the species was not actually named until 1876. It was probably introduced into Central America and Mexico in the mid-1800s. Since it requires so little care and flowers throughout the year, *F. boliviana* is a very popular garden shrub in many villages, where it often becomes locally naturalized.

Fuchsia hybrida and *F. magellanica* are both more recent introductions into the area and do not occur outside of cultivation as far as we know.

There are probably no plants of the rare, epiphytic and tuberous *Fuchsia decidua* alive in cultivation today. It has been cultivated within the last 15 years in Mexico, California, and Great Britain, and a cultivar distributed as "President Gosselin" in horticultural circles in the United States and Britain in approximately the past 30 years might have been *F. decidua*, but we cannot verify this because we have seen no specimens or living plants.

KEY TO THE SPECIES OF *FUCHSIA* IN MEXICO AND CENTRAL AMERICA

- 1a. Flowers borne in racemes or panicles.
 - 2a. Flowers erect, numerous, in terminal, di- to trichotomously branched panicles (sect. *Schufia*).
 - 3a. Leaves entire, smooth, 10–21 cm long; hermaphroditic; floral tube obconic, with flowers widening toward the apex in bud; anthers oblong, mostly ca. 2 mm long; style always exerted beyond the anthers, the stigma four-lobed, each lobe ca. 1.5 mm long. Mexico, Durango to Oaxaca. ----- 5. *F. arborescens*
 - 3b. Leaves minutely to coarsely serrate, ridged, 5–15 cm long; gynodioecious (functionally subdioecious), with hermaphroditic populations north of the Isthmus of Tehuantepec; floral tube cylindrical to narrowly obconic, not much widened above in bud; perfect flowers with ovoid-reniform anthers less than 2 mm long, generally ca. 1 mm; style exerted beyond or held below the anthers, stigma four-lobed to strongly reduced; pistillate flowers smaller, the anthers abortive, the stigma exerted and four-lobed. Mexico to Panama. ----- 6. *F. paniculata*
 - 2b. Flowers pendulous to spreading in simple racemes or few-branched panicles.
 - 4a. Floral tube less than 6 mm long; antipetalous stamens reflexed and included in the tube (sect. *Jimenezia*). ----- 4. *F. jimenezii*

- 4b. Floral tube more than 30 mm long; all stamens erect.
 - 5a. Flowers in compact, lateral panicles; petals much reduced, less than 3.5 mm long; flowering when leafless. ----- 3. *F. decidua* (sect. *Ellobium*)
 - 5b. Flowers in terminal, drooping racemes; petals more than 6 mm long; flowering with leaves.
 - 6a. Plants often with tubers; leaves ovate to cordate; sepals ascending to spreading, greenish; stigma green. ----- 2. *F. fulgens* (sect. *Ellobium*)
 - 6b. Plants without tubers; leaves elliptic to ovate; sepals initially spreading, then strongly reflexed, red; stigma cream. Introduced. -----
----- 7. *F. boliviana* (sect. *Fuchsia*)
- 1b. Flowers axillary, not in a definite inflorescence.
 - 7a. Antipetalous stamens reflexed and included in the tube; berry few-seeded (6–36); subdioecious to dioecious. ----- sect. *Encliandra* (see Breedlove, 1969)
 - 7b. Antipetalous stamens erect and exerted above the rim of the tube; berry many-seeded (>50); hermaphroditic.
 - 8a. Sepals shorter than the tube; petals green, 6–12 mm long. -----
----- 1. *F. splendens* (sect. *Ellobium*)
 - 8b. Sepals mostly longer than the tube; petals showy, 10–20 mm long, never green. Cultivated. (sect. *Quelusia*).
 - 9a. Tube 5–10 mm long, sepals 15–25 mm long, petals purple. -----
----- *F. magellanica* Lam.⁵
 - 9b. Tube 10–20 mm or more long, sepals generally 25–30 mm long; variable garden hybrids. ----- *F. hybrida* Hort.⁵

Fuchsia sect. **Ellobium** (Lilja) Breedlove, Berry, & Raven, **comb. nov.** *Ellobium* Lilja, *Linnaea* 15:262. 1841. TYPE: *Fuchsia fulgens* De Candolle; based on *Spachia* Lilja; non *Ellobium* Blume, 1826, nom. rejic.

Spachia Lilja, *Tidning Trädgårdsskötsel allmän Wextkultur* 8:62. 1840, hom. illeg., non *Spachea* Juss. 1838.

Hermaphroditic. Soft woody, terrestrial, or epiphytic shrubs, some species tuberous. Leaves opposite or ternate, membranous, elliptic-ovate to cordate. Flowers axillary, racemose, or paniculate. Floral tube longer than sepals. Petals usually ½ length of the sepals or less. Nectary unlobed, a smooth band 0.3–0.5 mm thick lining the base of the floral tube. Stamens biseriate, erect, shorter than the sepals or exerted less than 5 mm beyond them, the antisealous stamens longer than the antipetalous ones. Stigma green. Berry ellipsoid to narrowly cylindrical; seeds ca. 50–ca. 200, laterally compressed, oblong to irregularly triangular in outline, 1–2 mm long, 0.5–1.5 mm wide. Gametic chromosome number $n = 11$.

Distribution: Evergreen cloud forests and moist oak-pine forests from northern Costa Rica to Jalisco, Mexico, at altitudes of 1,450–3,400 m (Figs. 1 and 2).

Munz (1943) placed *Fuchsia splendens* (including *F. cordifolia*) and *F. fulgens* in the large, generalized sect. *Fuchsia*. *Fuchsia decidua* was included in sect. *Hemsleyella*, a smaller South American group with tubers, apetalous flowers, and often an epiphytic, dry season flowering habit. Geographically and morphologically, however, the three species of sect. *Ellobium* form a well defined group that does approach the above mentioned sections in several characters, but can be distinguished by the characters shown in Table 1.

⁵ See appendix for lists of specimens examined from Mexico and Central America.



FIGURE 1. Distribution of *Fuchsia splendens* (sect. *Ellobium*).

The species in sect. *Ellobium* follow a clear progression of specialization from *F. splendens*, the most generalized, to *F. decidua*, the most specialized. This progression consists of a reduction in petal size, change in flower position from axillary to racemose to paniculate, and the development of tubers and an epiphytic habit in *F. fulgens* and *F. decidua*, accompanied by a marked seasonality in the phenology of flowers and leaves. Furthermore, *F. splendens* is the most widespread species, and *F. decidua* is rare.

1. ***Fuchsia splendens*** Zuccarini, *Flora* 15, ii, Beibl., 102. 1832. TYPE: Los Molinos, Oaxaca, Mexico, 1827–1832, *Wilhelm Karwinsky* (M, holotype; photographs, F, GH, MICH, MO, POM, US; BR, G, isotypes). Lindl., *Bot. Reg.* 28:pl. 27. 1842. Curtis, *Bot. Mag.* 70:pl. 4082. 1844. Planch., *Fl. Serres Jard. Eur.* 5:t. 458. 1849. Watson, *Garden* 55:74, fig. 1899. Hemsl., *Gard. Chron.* 3(45):338, t. 1909. Standl., *Contr. U.S. Natl. Herb.* 23:1078. 1924. Munz, *Proc. Calif. Acad. Sci.* IV. 25:20, pl. 1, fig. 6. 1943. Standl. and Williams, *Fieldiana, Bot.* 24(7):534, fig. 85. 1963. Munz, *N. Am. Flora II.* 5:4. 1965. Chickering, *Flowers of Guatemala* 64, pl. 18. 1973.

Fuchsia cordifolia Benthams, *Pl. Hartw.* 74. 1841. TYPE: Near summit of Volcán Santa María ("Xetuch"), ca. 3,000 m, Quezaltenango, Guatemala, Nov. 1839, *Theodor Hartweg* 528 (K Benthams Herb., holotype; photograph, MO; BM, CGE, G, K Hooker Herb., LE, OXF, P, U, W, isotypes). Harrison, *Florist. Cab. and Florist's Mag.* 9:241, pl. 1841. Lindl., *Bot. Reg.* 27, pl. 70. 1841. Hook., *Icon. Pl.* 5:t. 450. 1842. Essig, *Nat. Hort. Mag.* 13:6, photo. 1934. Munz, *Proc. Calif.*



FIGURE 2. Distribution of *Fuchsia decidua*, *F. fulgens* (sect. *Ellobium*) and *F. jimenezii* (sect. *Jimenezia*).

Acad. Sci. IV. 25:21. 1943. Standl. and Williams, *Fieldiana, Bot.* 24(7):530. 1963. Munz, *N. Am. Flora II.* 5:5. 1965.

Fuchsia intermedia Hemsley, *Diag. Pl. Nov. Mex. Centr. Amer.* 1:14. 1878. TYPE: Summit of Mt. Totontepec, 3,000 m, Oaxaca, Mexico, April 1839, *Theodor Hartweg 460* (K, holotype; photograph, MO; BM, CGE, LE, OXF, P, W, isotypes). Standl., *Contr. U.S. Natl. Herb.* 23:1078. 1924.

Few- to many-branched, soft-wooded shrub 0.5–2.5 m tall, terrestrial or occasionally epiphytic on trees. Branchlets 0.5–3 dm long, 1–3 mm thick, triangular to quadrangular, subglabrous to densely short-pilose or villous; older branches with smooth reddish bark, exfoliating freely with age, 0.5–3 m long and 8–40 mm thick. Leaves opposite or occasionally ternate, membranous, ovate to cordate, rounded to cordate at base, acute to acuminate at apex, 35–130 mm long, 20–75 mm wide, pale to dark green and subglabrous to pilose or villous above, lighter below or red tinged and similarly pubescent, especially along nerves; secondary veins 5–9 on either side of the midvein, margin dentate to serrate; petioles reddish, pubescent, 12–80 mm long; stipules lance-filiform, 1–2 mm long, ca. 0.3 mm wide, deciduous. Flowers axillary and solitary in upper leafy nodes of the year's branches; pedicels spreading to drooping, slender, subglabrous to strigose, 35–75 mm long; ovary narrowly cylindrical; floral tube narrowly to broadly cylindrical, 20–46(–64) mm long, 4–9 mm wide and usually ventricose and laterally compressed at the base around the nectary, \pm dilated in upper half, 5–15 mm wide at the rim, pubescent or with glandular hairs outside, subglabrous or loosely strigose inside in lower $\frac{1}{2}$; sepals lanceolate, 8–20 mm long, 5–8 mm wide, spread-

TABLE 1. Comparison of sects. *Ellobium*, *Fuchsia*, and *Hemsleyella*.

Section	Presence of Petals	Presence of Tubers	Type of Nectary ¹	Epiphytism	Distribution
<i>Ellobium</i>	Yes	2 of 3 spp.	Band	Yes	Mexico, Central America
<i>Fuchsia</i>	Yes	None	Ring	No	Tropical Andes and Hispaniola
<i>Hemsleyella</i>	No	Most species	Band	Yes	Tropical Andes

¹ Band nectary is smooth and fully adnate to the floral tube; ring nectary is annular and mostly free from the tube. Three of the approximately 60 species in sect. *Fuchsia* have nectaries adnate to the tube, but they are variously lobed.

ing at anthesis; tube rose to bright red, sepals green with reddish base; petals olive green, ovate, 6–12 mm long, 4–8 mm wide, rounded to cordate at the base, subacuminate at the apex, erect; nectary a lustrous yellow band ca. 0.4 mm thick lining the basal 4–8 mm of the tube; stamens exerted beyond petals; filaments pale yellow green, the antisepalous ones 10–20 mm long, the antipetalous ones 6–14 mm long and inserted on the tube ca. 1 mm below the insertion of the petals; anthers oblong, yellow, 2–3 mm long, 1–2 mm wide; style glabrous, pale green, 40–76 mm long; stigma green, subconic, 2–3 mm long, 1–2 mm wide, 4-parted at the apex. Berry elongate, 20–40 mm long, 5–8 mm thick, verrucose, green to dark purple when ripe; seeds 1.5–2 mm long, ca. 0.5 mm thick. Gametic chromosome number, $n = 11$.

Distribution: Mexico to Costa Rica. Scattered in a few moist forest localities in Guerrero and Oaxaca, more common in cloud forest and moist oak-pine forest from Chiapas to Costa Rica, 2,000–3,400 m (Fig. 1). Flowering throughout the year.

Representative specimens examined: MEXICO, CHIAPAS: San Cristóbal las Casas, NE side of Zontehuitz, *Breedlove* 7799 (BM, DS, GH); ca. 2 km W of Nabenchauk, municipio Zinacantán, *Breedlove* 7493 (DS, GH); N & W slopes of Cerro Mozotal, road from Huixtla to Siltepec, *Breedlove* 25858 (MO); Cerro Huitepec, *Ghiesbreght* 698 (GH, K, LE, MO); Chamula, *Linden* 675 (G, K, LE); La Cola del Diablo, ca. 20 km N of San Cristóbal Las Casas, *Luteyn* 3566 (DUKE); Mt. Tacaná, *Matuda* 2322 (GH, NA, K); Motozintla, Pinabeto, *Matuda* 15466 (F, IPN, LL). GUERRERO: Pie de la Cuesta-Toro Muerto, *Hinton et al.* 11222 (GH, K, NY, US); Cerro Teotepec, *Rzedowski & McVaugh* 184 (DS, ENCB, MICH, TEX); Tlacotepec, *Paray* 2012 (ENCB); Piedra Ancha, Galeana district, *Hinton et al.* 14223 (GH, MICH, NY, US). GUATEMALA, CHIMALTENANGO: Chichoy Pass, *Hunnewell* 14675 (GH); Volcán Acatenango, *Hunnewell* 14766 (GH); Cerro de Tecpam, *Standley* 61000 (A). EL PROGRESO: between Finca Piamonte and Volcán Santa Luisa, *Steyermark* 43567 (BH). HUEHUETENANGO: Cerro Pixpíx, above San Idelfonso Ixtahuacán, *Steyermark* 50642 (BH); Cruz de Limón, between San Mateo Ixtatán and Nucá, *Steyermark* 49814 (BH); San Juan Ixcoy, Cordillera de los Cuchumatanes, *Steyermark* 50046 (BH). JALAPA: Montaña Miramundo, *Steyermark* 32833 (F). JUTIAPA: Asunción, Mita, Volcán Suchitán, *Steyermark* 31944 (F). QUEZALTENANGO: Cerro Quemado, *Kellerman* 5935 (LL, US); Cuesta de El Caracol, 5–8 km N of San Juan Ostuncalco, *Williams et al.* 22777 (G, S, W); Volcán Santa María, *Skutch* 867 (A, BM, G), *Skinner s.n.* (K); Volcán Zunil, *Steyermark* 34686 (F, US). QUICHÉ: Chiul, *Heyde & Lux* 1890 (GH, MO); above Nebaj toward Acatenango, *Hunnewell* 14776 (GH). SACATEPÉQUEZ: Volcán de Agua, *Donnell Smith* 2174 (F, GH, M, NY, PH). SAN MARCOS: San Luis, ca. 6 km W of Ixchiguán, *Beaman* 3243 (DUKE); San Sebastián, Volcán Tajumulco, *Steyermark* 35844 (F, NY). SOLALÁ: Volcán San Pedro, N slopes, *Steyermark* 47260 (BH); Volcán Atitlán, *Steyermark* 47526 (F, G); ca. 18 km SE of Totonicapán, *Webster et al.* 11760 (MO); Cerro Metía Tecum, 5–10 km S of Los Encuentros, *Williams et al.* 41729 (BM, MICH). TOTONICAPÁN: Between Los Encuentros and Totonicapán, *Bunting* 1302 (F); ca. 13 km S of Totonicapán, *Williams et al.* 22909 (G). EL SALVADOR, CHALATENANGO: summit of

Los Esemiles, *Tucker 1116* (BH, G, LL, MICH, NY, PH). SANTA ANA: Cerro Montecristo, *Allen 7154* (F, GH, LL, NY, US). COSTA RICA, CARTAGO: near Ojo de Agua camp, *Dayton 3029* (F, MO); Villa Mills, *Holm & Iltis 516* (A, BM, F, G, MO, NY), *Raven 22051* (DS); Cerro Sákira at La Asunción, *Wilbur & Stone 10036* (DUKE). SAN JOSÉ: Cerro de la Muerte, *Burch 4716* (DUKE, MO); trail from Canaan to Chirripó via Los Angeles, N of Río Talari, *Burger & Liesner 7396* (F, S); Cordillera de Talamanca, Pacific slopes of Chirripó massif, *Davidse & Pohl 1619* (MO); Cerro de la Vueltas, *Pittier 10501* (BR, G, US); 5 km SE of La Asunción, before La Georgina, *Wilbur 14386* (DUKE, MO); 9 km NW of La Asunción, *Wilbur 14407* (DUKE).

Cultivated specimens: AUSTRIA, Vienna, 1903 (W). ECUADOR, PINCHINCHA: Hacienda Cataguango, W of Amaguaña, 1976, *Ortiz s.n.* (QCA). GERMANY, Berlin, 1905, *Bothe s.n.* (B). GUATEMALA, Guatemala City, 1947, *Brenckle 47-431* (NY). IRELAND, Dublin Botanical Garden, 1844 (K). SOVIET UNION, Leningrad, 1845 (LE). UNITED STATES, CALIFORNIA: Berkeley, *Hutchison 54.522*. (UC).

This species is unique in its elongate ovary and fruits, green petals, and ventricose, laterally compressed base of the floral tube. The peculiar compression of the floral tube has been well illustrated in horticultural journals; e.g., by Planchon (1849) and Hemsley (1909).

Fuchsia splendens has the widest range in sect. *Ellobium*, from Costa Rica to Guerrero, Mexico. Variation in leaf shape is considerable, but it is mostly related to the degree of development of the leaf. On the same individual, the young upper leaves are often ovate while the lower ones are cordate. Pubescence varies to a much greater extent, with densely villous hairs on *Linden 657* (G, K, LE; from Chiapas); glandular hairs on *Breedlove 9347* (BM, GH; also from Chiapas); finely pubescent hairs or even subglabrous plants in most Costa Rican collections. The most variable character of all is floral tube dimensions. Differences in floral tube lengths were used to describe *F. cordifolia*, longer-tubed than *F. splendens*, and *F. intermedia*, of intermediate length. Field studies and analysis of herbarium specimens have shown no geographic or ecological pattern to this variation, however. The type of *F. cordifolia* has floral tubes ca. 40 mm long; the type of *F. splendens* has floral tubes ca. 25 mm long. This does not nearly cover the variation found, however, since *Skutch 867* (A, BM, G), from Volcán Santa María in Guatemala, has floral tubes to 64 mm long. *Skinner s.n.* (K) is from the same mountain at a similar elevation, yet it has floral tubes only 20 mm long. In view of this variation and the presence, throughout the range, of the common assemblage of unusual characters mentioned above, we are including both *F. cordifolia* and *F. intermedia* as synonyms of *F. splendens*.

Diploid gametic chromosome counts of $n = 11$ were obtained from *Breedlove 7796* (DS) and *Raven 22051* (DS). Both Bentham (1841, p. 74) and Standley & Williams (1963) noted that inhabitants of the Volcán Santa María area called this species "Melocotoncito" (little peach). Hunters in that area would commonly rely on the conspicuous, epiphytic bushes of *F. splendens* for their sour, juicy fruits when water was not available.

2. ***Fuchsia fulgens*** De Candolle, Prodr. 3:39. 1828. TYPE: Plate 362 of Sessé & Mociño's *Flora Mexicana Icones*, ined. (Copy at G). The collection of illustrations made in Mexico by the Expedición Real de Botánica was lent by Mociño to A. De Candolle in 1813. These were copied by De Candolle in Geneva when Mociño requested their return in 1817 on very short notice (Sprague, 1926). De Candolle later went on to describe some 270 new species

from these illustrations, including *F. fulgens*. Plate 362 undoubtedly corresponds to the specimens collected by Sessé et al. and used to describe *F. racemosa* Sessé & Mociño (= *F. fulgens*); the type locality for *F. fulgens* is therefore the same as for *F. racemosa* (in the mountains of Pátzcuaro, Michoacán, Mexico). Lindl., Bot. Reg. 24:t. 1. 1838. Curtis, Bot. Mag. 67:t. 3801. 1840. DC., Calques Dessins Mociño Sessé 1:pl. 362. 1874. Raimann in Engl. & Prantl, Nat. Pfl. 3(7):200, fig. 1893. Watson, Garden 55:75, fig. 1899. Standl., Contr. U.S. Natl. Herb. 23:1078. 1924. Essig, Nat. Hort. Mag. 13:9, photo. 1934. Munz, Proc. Calif. Acad. Sci. IV. 25:55, pl. 8, fig. 43. 1943. Chittenden, Dict. Gard. 2:846, fig. 1951. Munz, N. Am. Flora II. 5:6. 1965. Morley & Everard, Wild Flowers of the World, pl. 173, fig. F1. 1970. *Spachia fulgens* (DC.) Lilja, Tidning Trädgårdsskötsel allman Wextkultur 8:62. 1840. *Ellobium fulgens* (DC.) Lilja, Linnaea 15:262. 1841.

Fuchsia fulgens pumila Carrière, Rev. Hort. 53:150, 1881. TYPE: Rev. Hort. 53:150, plate, 1881. No specimens of this entity were seen. The plant illustrated is from garden material of unspecified origin, cultivated in France ca. 1881.

Fuchsia racemosa Sessé & Mociño, Pl. Nov. Hisp. 58. 1888; non Lamarck, 1788. TYPE: On boulders in the mountains of Pátzcuaro, Michoacán, Mexico, Sept. 1790, Martín Sessé, José Mociño, Juan Diego del Castillo & José Maldonado 5211 (MA, lectotype here designated. A second sheet of *F. fulgens* at MA has a Ruiz & Pavón label, but it is probably a duplicate of the type material). Fl. Mex. 101. 1893.

Soft-wooded shrubs 0.5–3 m tall, with thickened, tuberous underground parts, often epiphytic in trees or on rocks. Branchlets 4–25 cm long, 1–5 cm thick, semi-succulent, quadrangular, subglabrous to strigose, reddish; older branches and stems freely exfoliating, 1–6 cm thick. Leaves opposite, soft-membranous, ovate to cordate, rounded to cordate at base, acute at apex, (5–)9–15 cm long, (3–)5–12 cm wide, pale green above, lighter below and red-tinged; young leaves canescent to tomentose, the older ones short villous; secondary veins 8–10 on either side of the midvein, margin denticulate to serrulate with red glandular teeth; petiole stout, strigose, 3–8 cm long; stipules subtuberculate, lance-deltoid, 1.2–2 mm long, 0.2–0.5 mm wide, deciduous. Flowers several to many in terminal, drooping racemes, the rachis 3–20 cm long; bracts reflexed, ovate to elliptic, 0.5–2.5 cm long; pedicels slender, strigose, 10–20 mm long; ovary cylindrical, 12–15 mm long, 3–4.5 mm thick, strigose; floral tube narrowly funnelform, 50–65 mm long, 2–4 mm wide at the base, gradually widened above until 7–10 mm wide at the rim, loosely villous outside and inside; sepals lanceolate, subacuminate, 12–17 mm long, 4–6 mm wide, spreading or suberect at anthesis; tube pink to dull red, sepals pale red and yellow green towards the apex; petals bright red, elliptic to ovate, 6–9 mm long, 4–6 mm wide, rounded at base, acute at apex, erect; nectary a smooth yellow green band 0.3–0.4 mm thick lining the basal 3–5 mm of the tube; filaments light red, the antisepalous ones 9–10 mm long, the antipetalous ones 5–7 mm long; anthers white, 2.5–3 mm long, 1–2 mm thick; style slender, pink, pubescent in lower ½, 60–82 mm long; stigma green, subconic, 2–3 mm long, ca. 1.5 mm thick. Berry elongate, 20–30 mm long, 8–15 mm thick, glabrous to sparsely strigillose, dark purple; seeds 1–1.5 mm long, ca. 1 mm thick, ovate to subtriangular in outline. Gametic chromosome number, $n = 11$.

Distribution: Mexico. Mostly epiphytic, in oaks or on rocks, especially around

seepages and waterfalls along the Trans-Mexican Volcanic Belt from Jalisco to the State of Mexico and in the Sierra Madre Occidental of Guerrero, 1,450–2,300 m (Fig. 2). Flowering in the wet season, June through September.

Representative specimens examined: MEXICO, GUERRERO: Omiltemi, 60 km W of Chilpancingo, *Rowell 3047* (MICH), *Tillett 637-150* (DS, GH). JALISCO: Huejotitán, *Diguet s.n.* (S); E slopes of Volcán Colima, *Goldsmith 22* (DS, F, GH, MO, NY, UC, US); Zapototán de Hidalgo, S of Guadalajara, *Gregory & Eiten 230* (MICH, MO); San Juan Cosalá, *Villarreal de Puga 28* (IPN); 10–15 km S of Autlán, *Wilbur & Wilbur 1438* (DUKE); E of Manantlán, ca. 22 km S-SE of Autlán, *Wilbur & Wilbur 1816* (DUKE). MEXICO: Amanalco, Valle de Bravo, *Dressler 2433* (US); Tequexquipan, Temascaltepec District, *Hinton 823* (BM, K); Rincón del Carmen, Temascaltepec District, *Hinton 1744* (BM, G, GH, K); Salitre-Cañitas, *Hinton et al. 4311* (BM, G, K); Comunidad, Temascaltepec District, *Hinton 4894* (A, BM, K); Ipericones, Temascaltepec District, *Hinton 3893* (K), *Hinton et al. 8071* (DS, GH, K, MICH, NY, U); Nanchititla, *Matuda et al. 30368* (GH, MEXU). MICHOACÁN: Km 16 of Uruapan-Los Reyes road, *Beaman 2418* (GH); 26 km E of Morelia, *Breedlove 7726* (DS); NW of Uruapan at San Juan Nuevo, *Breedlove 15776* (BM, DS); near Morelia, *Hartweg 286* (CGE, G, K, LE, OXF, W); Zitácuaro, *Hinton et al. 11883* (GH, K); S of Torricillas, Coalcomán District, *Hinton 13987* (H, NA, PH); S of Naranjillo, *Hinton et al. 13952* (PH); Tancítaro, *Leavenworth 303* (F, GH, MICH, MO, NY); Paracho, km 47–48 of Guadalajara-Uruapan road, *Moore & Wood 4050* (A, BH, GM, DUKE, MICH); Pátzcuaro, *Pringle 4123* (BH, BM, G, GH, K, LE, MO, PH, S, W, Z); Tarascón, *Pringle 11988½* (BH, GH, K).

Cultivated specimens: AUSTRIA, Vienna, 1849 (W). FRANCE, Nantes, 1839 (BM); Paris, 1843 (P). GERMANY, Munich, 1843 (BR); Heidelberg, 1923 (BH); Berlin, 1966, *R196* (B). GREAT BRITAIN, 1836–1843, *Saul s.n.* (NA). MEXICO, VERACRUZ: Jalapa, 1881, *Kerber s.n.* (W). SOVIET UNION, Leningrad, 1840 (LE). UNITED STATES, CALIFORNIA: Berkeley, 1965, *Hutchinson 49.803.1* (UC, NA); Santa Barbara, 1910, *Popenoe 618* (NA).

The long-tubed, many-flowered racemes of *Fuchsia fulgens* resemble those of South American species such as *F. boliviana* and *F. dependens*. It is easily distinguished from these species, however, by the presence of tubers, the occasionally epiphytic habit, the cordate leaves, and the greenish sepals and stigma. It is sympatric with *F. decidua* in Jalisco and Guerrero, but *F. decidua* flowers when leafless in the dry season (December–May), and *F. fulgens* flowers with leaves in the rainy season (June–November). Both *Hinton 3893* (K) and *Hinton et al. 11883* (GH, K) were collected in May and are unusual in having just a few young expanding leaves at the shoot apices and flowers borne on dense racemes from the axils of older leafless branches, much like *F. decidua*.

Diploid gametic chromosome counts of $n = 11$ were obtained from *Breedlove 15776* (BM, DS) and *Hutchison 49-803* (UC).

3. *Fuchsia decidua* Standley, Publ. Field Mus. Bot. 4:248. 1929. TYPE: La Bufa, Real Alto, Sierra Madre Occidental, 2,500 m, Jalisco, Mexico, 30 January 1927, *Ynes Mexia 1601* (F 579815, holotype; A, BM, C, CAS, DS, G, MICH, MO, NY, UC, US, Z, isotypes). Munz, Proc. Calif. Acad. Sci. IV. 25:75, pl. 12, fig. 75. 1943, N. Am. Flora II. 5:7. 1965.—FIG. 3.

Shrub 0.5–2 m high, terrestrial, in rock crevices, or epiphytic in trees as high as 10 m above the ground, with fleshy tubers 2–4 cm thick and stoloniferous lateral shoots. Branchlets 5–15 cm long, 3–6 mm thick, subquadrangular, glabrous; older branches 0.5–ca. 3 m long, 6–20 mm thick, with very loosely peeling, copper brown bark. Leaves opposite, chartaceous, elliptic to ovate-cordate, cuneate to cordate at base, acute to acuminate at apex, 9–17 cm long, 5–8 cm wide, sparsely strigillose above, glabrous below; margin subentire to denticulate; deciduous, leafy in the wet season (June–November); petiole glabrous to strigillose,

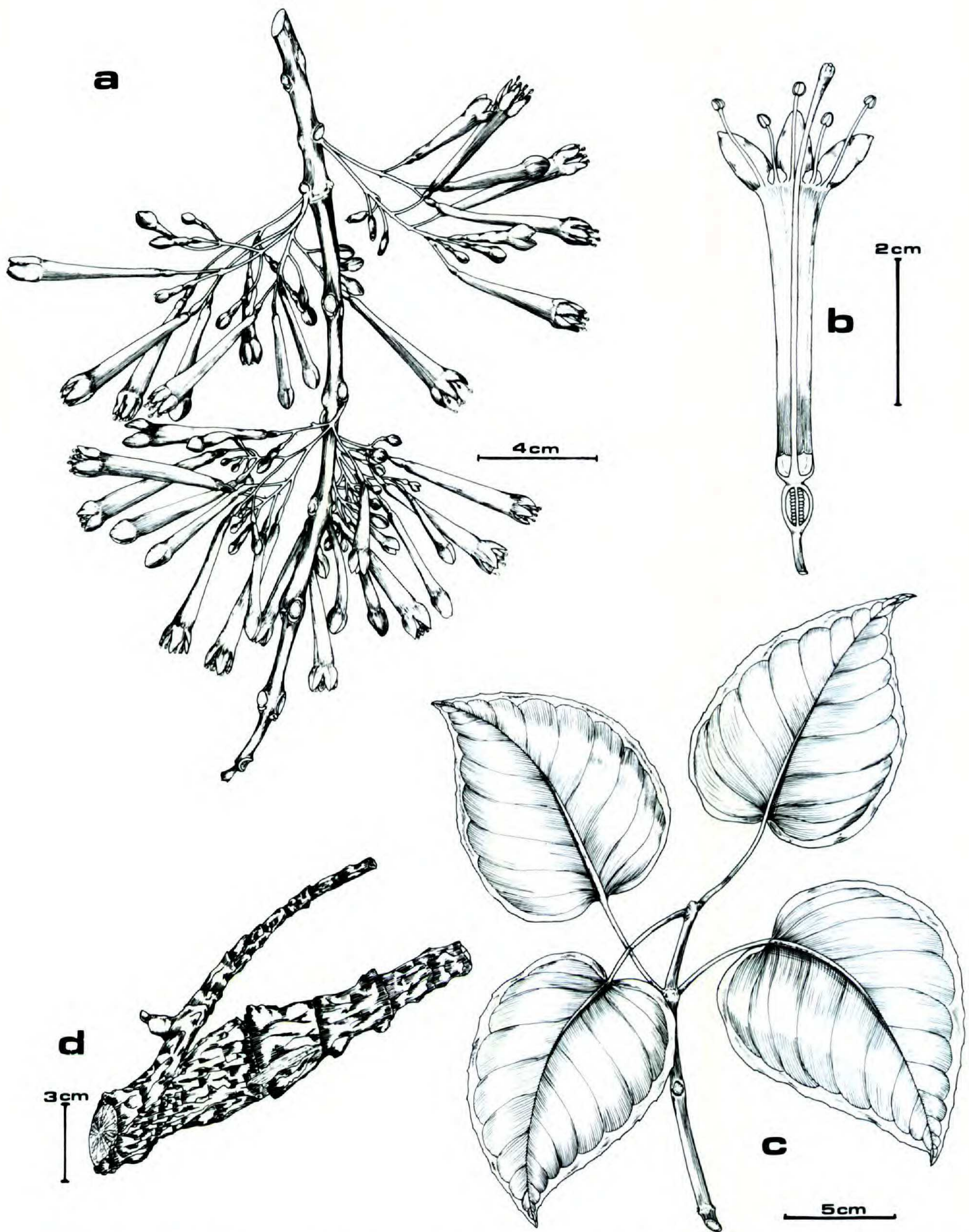


FIGURE 3. *Fuchsia decidua* Standley.—a. Inflorescence.—b. Flower, longitudinal section. a & b from McVaugh 26157 (MICH), Jalisco, Mexico.—c. Leaves. From MacDougall H.521 (MO), Oaxaca, Mexico.—d. Tuber. From Mexia 1061 (A), Jalisco, Mexico.

3–5 cm long; stipules triangular, 1–1.5 mm long, ca. 0.5 mm wide, deciduous. Flowers numerous in compact, lateral panicles on new shoots arising from the nodes of older stems, the rachis 2–6 cm long, drooping, flowering when leafless (December–May); pedicels slender, glabrous, 6–11 mm long, to 15 mm in fruit;

floral tube narrowly funnellform, 30–48 mm long, 1.5–3.5 mm wide at base, then slightly constricted above nectary and gradually widened above until 5–9 mm wide at rim, glabrous to sparsely strigose outside, glabrous within; sepals lance-oblong, 8–13 mm long, 3–6 mm wide, apex obtuse, spreading to suberect at anthesis; tube and sepals reddish pink; petals red, fleshy, oval to reniform, 1.5–3.5 mm long, 1.5–4 mm wide, erect; nectary a smooth yellow green band 3–5 mm high lining the base of the tube; antisepalous filaments 10–17 mm long, antipetalous filaments 5–12 mm long; anthers 1.5–3 mm long, 1–2 mm wide; style slender, 55–66 mm long; stigma green, slender, 1–1.5 mm long, ca. 1 mm thick. Berry ellipsoid, 8–12 mm long, 4–6 mm thick, glabrous, greenish purple; seeds 1.5–2 mm long, 0.5–1.0 mm thick, ovate in outline. Gametic chromosome number, $n = 11$.

Distribution: Mexico. Rare shrubs and epiphytes in moist oak-pine and evergreen cloud forests in the Sierra Madre Occidental from Jalisco to Oaxaca (Fig. 2). Flowering in the dry season (December–May).

Specimens examined: MEXICO, GUERRERO: Omiltemi, ca. 60 km W of Chilpancingo, *Breedlove 15821* (DS, LL), *Lachica s.n.* (IPN); W of Filo de Caballo, *Breedlove 15829* (DS); Highway 95 ca. 6 km W of turnoff to Chichihualco, *Croat 45630* (MO); Cerro Alquitrán, *Kruse s.n.* (DS); Chichihualco, Camotla, Cerro de la Pastilla, *Rzedowski 16435* (IPN, MICH); Campamento El Gallo, *Rzedowski & McVaugh 189* (DS, MICH). JALISCO: Sierra de Manantlán, above Durazno, *Boutin 3036* (MO); Mesa de los Gallos, *González 843* (MO); SSE of Autlán, SE of Ahuacapán, *McVaugh & Koelz 918* (MICH); SE of Autlán, trail from Chante, above Rancho Manantlán, *McVaugh 10295* (MICH); near Santa Mónica, *McVaugh 14047* (MICH); Autlán, Sierra de Manantlán, between El Chante and Cuzalpa, *McVaugh 23100* (IPN, MICH); Ayutla, San Miguel de la Sierra, *McVaugh 23500* (MICH); Sierra de Manantlán, 25 km S of El Chante, *McVaugh 26157* (MICH). OAXACA: S of Tlaxiaco, San Andrés Chichahuastla, Cerro Zarzamora, *MacDougall H.521* (MO), *s.n.* (US).

Cultivated specimens: MEXICO, DISTRITO FEDERAL: Mexico City, *Kruse in 1967* (DS). OAXACA: Oaxaca, *MacDougall 468* (US).

The tiny, thick petals and leafless, dry-season flowering distinguish *Fuchsia decidua* from the related *F. fulgens* and *F. splendens*. The habit of *F. decidua* is unusual and is shared only by some members of the South American sect. *Hemsleyella*. *Fuchsia decidua* grows epiphytically, mostly on the trunks of oaks, but also terrestrially on rocks. Plants with thick, fleshy, prostrate stems ca. 2 cm thick extending up to nearly 3 m long are rooted in moss and rich humus (*F. Boutin*, T. MacDougall, pers. comm.). This species is well adapted to the rather seasonal climate of the areas in which it occurs. The tubers store food and water during the wet season, when the plants are leafy and actively growing vegetatively. In the dry season, the plants are deciduous and flower on stems from the previous season's growth. The seeds are apparently spread by birds from tree to tree and from cliff to cliff. A single somatic chromosome count of $2n = 22$ was obtained from *Breedlove 15821* (DS).

Fuchsia sect. **Jimenezia**, Breedlove, Berry & Raven, sect. nov. TYPE: *Fuchsia jimenezii* Breedlove, Berry & Raven.

Hermaphroditicus. Folia opposita ellipticaeque. Flores racemosi vel interdum paniculati; nectarium disco annulari styli basin cingens et basin tubi adnatum; stamina inaequalia, filamentis antisepalis erectis et supra tubum exsertis, antipetalis in tubum reflexis inclusisque. Bacca subglobosa, seminibus multis, compressis.

Hermaphroditic. Glabrous shrubs. Leaves opposite, elliptic to lance-elliptic. Flowers in terminal racemes or few-branched panicles. Floral tubes less than 5 mm long, shorter than sepals or petals. Nectary annular, irregularly 4-lobed, adnate to the tube. Stamens biseriate, the antisepalous stamens erect, the antipetalous stamens reflexed and included in the tube. Berry subglobose; seeds many, ca. 50–ca. 100, laterally compressed, 0.9–1.2 mm long, 0.5–0.7 mm wide. Gametic chromosome number, $n = 11$.

4. *Fuchsia jimenezii* Breedlove, Berry & Raven, *sp. nov.*—TYPE: Monte verde, exposed crest of the Sierra de Tilarán, Puntarenas, Costa Rica, 23 June, 1967, *Thomas Emmel* (DS 614763, holotype; BM, CAS, ENCB, F, GH, K, LE, LL, MICH, NT, RSA, US, isotypes). This species is dedicated to Alfonso Jiménez Muñoz, a long time student of the Costa Rican flora, who first called this entity to our attention as an undescribed species in 1967. FIG. 4.

Fuchsia arborescens sensu Woodson & Schery, *Ann. Missouri Bot. Gard.* 46:328. 1959, pro parte.

Frutex erectus vel scandens 0.4–2.0 m altus, omnino glaber; rami ad 3 cm crassi cortice subtiliter fissurato. Folia opposita, subcoriacea, elliptica vel lanceo-elliptica, (3–)6.5–11.5 cm longa, 2.5–4.8 cm lata. Flores racemosi vel interdum paniculati, racemo 5–20 cm longo; pedicelli erecti vel divergentes, tenues, 6–12 mm longi, fructu ad 18 mm longo; tubus floralis subcylindricus vel subobconicus, 2.5–4.5 mm longus, apice 2–4.5 mm latus, basi 1.5–2.5 mm latus; sepala late lanceolata, 4–6 mm longa, basi 2.5–3.5 mm lata, divergentes; tubus sepalaeque rubra vel roseo-rubra; petala rosea, suborbicularia vel ovata, 4–6 mm longa, 3–4 mm lata, basi rotundata, apice rotundata vel acuta, erecta; discus annularis lobis plerumque quattuor vel pluribus supra basin tubi 1–1.5 mm elevatus; filamenta anti-sepala 1–2 mm longa erectaque, antipetala 0.8–1.5 mm longa, in tubum reflexa inclusaque, antherae 1.5–2 mm longae, 0.9–1.2 mm crassae; stylus crassus 6–8 mm longus stigmatate ca. 1 mm longo, ca. 1 mm crasso. Bacca subglobosa, 10–12 mm longa, in maturitate ca. 10 mm crassa, rosea ad atrorubra, seminibus multis 0.9–1.2 mm longis, 0.5–0.7 mm crassis, in ambitu oblongibus vel subtriangularibus. Numerus gameticus chromosomatum, $n = 11$.

Scandent subshrub 0.5–1.5(–2) m tall, glabrous throughout. Branchlets 1–5 dm long, 1–3 mm thick, quadrangular; older branches terete, with pale tan, finely fissured bark. Leaves opposite, subcoriaceous, elliptic to lance-elliptic, acute at base, acute to acuminate at apex, (3–)5–11.5 cm long, (1–)2.5–5 cm wide, dark green above, flushed purple beneath; secondary veins 10–12 on either side of the midvein, margin subentire to denticulate with small, glandular teeth; petiole stout, 1–2 mm thick, red, 4–9 mm long; stipules semisucculent, deltoid, dark when dry, 0.8–1.0 mm long and wide, often connate, deciduous. Flowers numerous in terminal racemes, rarely axillary, or occasionally in 2–3-branched panicles; rachis 5–20 cm long; pedicels erect to spreading, slender, 6–12 mm long, elongating up to 18 mm long in fruit; ovary cylindrical-fusiform, 4–6 mm long, ca. 3 mm thick, lustrous red-pink; floral tube obconic to subcylindric, 2.5–4.5 mm long, 1.5–2.5 mm wide at base, widening to 2.5–4.5 mm wide at rim; sepals broadly lanceolate, 4–6 mm long, 2.5–3.5 mm wide, apex acute, spreading; tube and sepals red to rose-red; petals rose-pink, suborbicular to ovate, 4–6 mm long, 3–4 mm wide, rounded at the base, rounded to acute at the apex; nectary an irregularly to 4-lobed ring-shaped disc adnate to the base of the floral tube, 1–1.5 mm high; filaments dull red, the antisepalous filaments erect and exerted above the rim of the tube, 1–1.5 mm long, the antipetalous filaments reflexed and included in the tube, 0.8–1.4 mm long; anthers white, 1.5–2.0 mm long, 0.9–1.2 mm thick; style

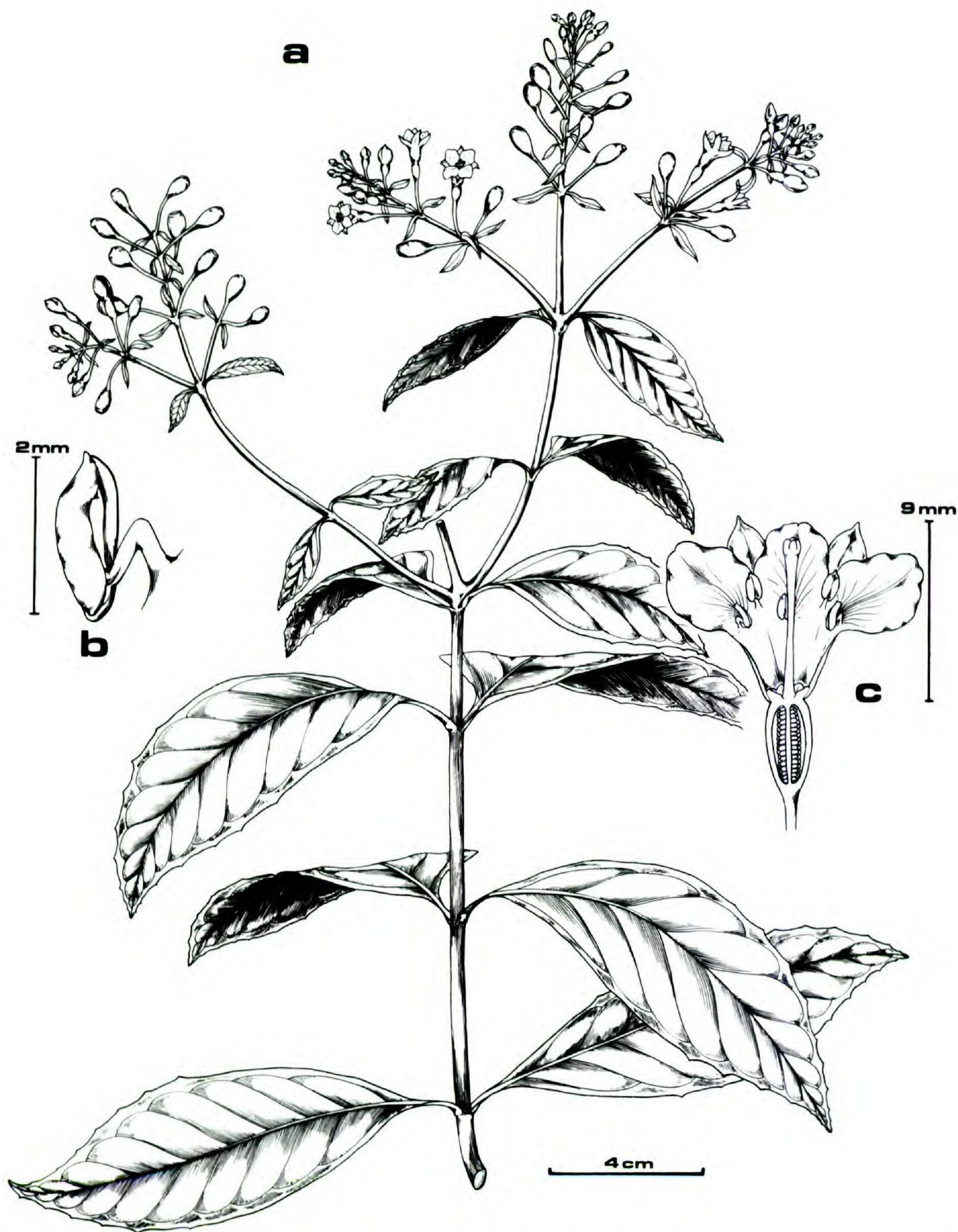


FIGURE 4. *Fuchsia jimenezii* Breedlove, Berry & Raven.—a. Habit; rachis and flowers are divergent to pendant in life.—b. Antipetalous anther.—c. Flower, longitudinal section. From Wilbur 14238 (MO), Monteverde, Puntarenas, Costa Rica.

stout, 6–8 mm long, the stigma capitate and obscurely 4-cleft at the apex, 1–1.5 mm long, ca. 1 mm thick. Berry subglobose, 10–12 mm long, ca. 10 mm thick when ripe, light to dark red, lustrous; seeds reddish, 0.9–1.2 mm long, 0.5–0.7 mm thick. Gametic chromosome number, $n = 11$.

Distribution: Panama and Costa Rica. Scattered in mostly secondary vegetation of wet evergreen cloud forests from Chiriquí Province of northern Panama

to the northernmost extension of Puntarenas Province of Costa Rica, 1,500–1,900 m (Fig. 2). Flowering throughout the year.

Specimens examined: COSTA RICA, CARTAGO: Ca. 10 km S of Tapantí on road above Río Grande de Orosi, *Burger & Burger 7561* (MO); Tapantí Reserve, Río Dos Amigos, *Croat 36223* (MO); 8.5 km S of Tapantí, *Lent 1372* (BM, F, MO). HEREDIA: Río Vueltas, E slope of Volcán Barba, *Burger & Liesner 6438* (F, GH); Vara Blanca, *Chrysler 5016* (F); Alto de los Robles, San Rafael, *Jiménez 2533* (F); Río Patria, SE slopes of Volcán Barba, *Jiménez 2300* (F); vicinity of Cerro Chompipe between Río la Vueltas and Quebrada Cabrú, *Luteyn & Wilbur 4441* (CAS, DUKE); San Isidro, Cerro de las Lajas, *Standley & Valerio 51567* (US); 12 km NE of San Rafael, *Wilbur et al. 15981* (DUKE); vicinity of Cerro Chompipe, between Río Las Vueltas and Río Nuevo, *Wilbur & Luteyn 18566* (DUKE, MICH, MO). PUNTARENAS: Monteverde, Sierra de Tilarán, *Almeda et al. 2022* (DUKE, MO), *Burger & Baker 9746* (U), *Burger & Gentry 8759* (F), *Haber 434* (MO), *Lorence & Pierce 1722A* (MO), *Palmer 55* (CR), *75* (CR), *171* (CR), *Solomon 5370* (MO), *Wilbur 14238* (DUKE, MO). SAN JOSÉ Vicinity of Cascajal, 3–6 km beyond Las Nubes, *Almeda et al. 2360* (MO); Alto La Palma, above Río Hondura, *Lent 1341* (DUKE, F, S); near Quebrada Grande, 3 km NW of Cascajal, *Lent 2310* (F); La Hondura, *Standley 36587* (US). PANAMA, BOCAS DEL TORO: Róbalo trail, N slopes of Cerro Horqueta, *Allen 4965* (G, MO, RSA); E slope of La Zorra to Divide, *Kirkbride 831* (MO). CHIRIQUÍ: Bajo Mono-Róbalo trail, W slopes of Cerro Horqueta, *Allen 4816* (G, RSA); trail from Rio Palo Alto road, near peak of Pate Macho, *Hammel 5785* (MO); Cerro Colorado, ca. 32 km from Rio San Felix, *Sullivan 310* (MO), *317* (MO); near Bajo Chorro, *Woodson & Schery 700* (MO).

This species is remarkable in being totally glabrous. The antipetalous stamens reflexed down into the floral tube is found elsewhere in the genus only in sect. *Encliandra*, which differs strongly in its subdioecious to dioecious, axillary flowers, strongly four-lobed stigmas, and few-seeded berries. A gametic chromosome number of $n = 11$ was obtained from *Haber 434*.

Fuchsia sect. **Schufia** (Spach) Munz, Proc. Calif. Acad. Sci. IV. 25:84. 1943.
Schufia Spach, Hist. Nat. Vég. Phan. 4:411. 1835. TYPE: *Fuchsia arborescens* Sims.

Hermaphroditic, morphologically gynodioecious, or subdioecious. Small trees. Leaves opposite or 3–4 verticillate, elliptic to oblanceolate. Flowers numerous and erect in terminal, di- or trichotomously branched panicles, 10–25 cm long and 9–20 cm wide. Floral tube, sepals, and petals nearly equal in length. Nectary annular, smooth to ± 4 -lobed, adnate to the base of the floral tube. Stamens biseriate, erect, the antisepalous stamens longer than the antipetalous stamens. Berry subglobose, with a waxy bloom when ripe; seeds ca. 50–ca. 100, laterally compressed, oval to irregularly triangular in outline, 1–1.5 mm long, 0.5–0.9 mm wide. Gametic chromosome number, $n = 11$.

Fuchsia arborescens and *F. paniculata* have generally not been separated in the past. *Fuchsia arborescens* was first collected in Mexico in 1790 by Sessé and Mociño, but the name *Fuchsia arborea* Sessé & Mociño was not published until their manuscripts were rediscovered and published in 1888 (McVaugh, 1977). Sims (1825) first published a description and illustration of *F. arborescens*; his plate was dated December, 1825, preceding by just a month Lindley's publication of the same name (Lindley, 1826). Lemaire (1848) recognized that Central American plants of this group had more ridged and serrate leaves than the typical *F. arborescens* from Mexico, and he consequently described his Guatemalan plants as a variety of that species. Subsequently, Lindley (1856) gave specific status to these serrate-leaved plants under the name *F. paniculata*.

The male sterility and floral dimorphism prevalent in most populations of

Fuchsia paniculata have provided another source of confusion in this group. Donnell Smith (1898) first recognized two distinct flower sizes in his Guatemalan collections and called the larger-flowered ones *F. arborescens* var. (?) *megalantha* (perfect-flowered plants). In their field studies of the Panamanian flora, Woodson & Seibert (1937) realized that the different flower sizes were due to sexual differences and termed the species "polygamodioecious." Seibert noted that only the pistillate plants bore fruit and had smaller flowers but larger stigmas than "those plants which are apparently incapable of fructification" (Woodson & Seibert, 1937, p. 196). In his 1943 monograph of the genus, Munz failed to recognize the different sexual morphs and instead named three different forms of *F. arborescens*.

As understood here, *Fuchsia arborescens* consists entirely of hermaphroditic plants and is quite uniform throughout its range. The leaves are larger than those of *F. paniculata* and have a smooth surface and entire margins. The flowers of *F. arborescens* are broader in bud than those of either floral morph of *F. paniculata*, and the anthers are oblong and larger than the ovoid-reniform anthers in perfect flowers of *F. paniculata* (Fig. 5). Also, the stigma of *F. arborescens* is always conspicuously four-lobed and well exerted above the anthers.

Fuchsia arborescens and *F. paniculata* are allopatric except for a small overlap of ranges in northern Oaxaca and in Veracruz. Some unusually pubescent collections occur in the area of overlap in Oaxaca. In *F. paniculata*, Jurgensen 530 (G) and Galeotti 3035 (W) are pilose, and short, dense pubescence is found on two collections referable to *F. arborescens*, Smith 615 (GH) and Karwinsky? 46 (G). This last specimen has large leaves with serrulate margins, but the flowers and stamens agree much more with those of *F. arborescens* than with those of *F. paniculata*.

The general appearance of these fuchsias strongly suggests that of certain Rubiaceae. In northern Panama, *F. paniculata* is sympatric with *Psychotria angustifolia* HBK, and the two can only be distinguished upon close examination. They probably share common pollinators.

5. ***Fuchsia arborescens*** Sims, Bot. Mag. pl. 2620, 1825. Lindl., Bot. Reg. pl. 943. 1826.—TYPE: Plate 2620 in Sims, Bot. Mag. 1825, lectotype, here designated, from cultivated material grown from seed sent in 1823 by George Bullock, who obtained the seeds from plants in cultivation at the Botanic Garden in Mexico City. The Mexican plants were probably sown by Martín Sessé and are likely progeny of the type specimen of *Fuchsia arborea* Sessé & Mociño. *Schufia arborescens* (Sims) Spach, Hist. Nat. Vég. Phan. 4:411. 1835. *Fuchsia arborescens* var. *typica* Munz, Proc. Calif. Acad. Sci. IV. 25: 85, pl. 14, fig. 75. 1943. FIG. 5a.

Fuchsia arborea Sessé & Mociño, Pl. Nov. Hisp. 58. 1888. TYPE: Uruapán, Michoacán, Mexico, Sept. 1790, Martín Sessé, José Mociño, Juan Diego del Castillo & José Maldonado 5216 (F 845520, lectotype here designated; MA, possible isolectotype; the one specimen of *F. arborescens* at MA has a Ruiz & Pavón label and is annotated as *F. paniculata*, but it is most probably mislabelled from a Sessé et al. collection. The sheets at MA and F appear to have been taken from the same plant).

Hermaphroditic. Erect, woody shrubs or small trees 3–8 m tall, mostly glabrous throughout. Branchlets ascending, 1–4 dm long, 2–5 mm thick, subtriangular to

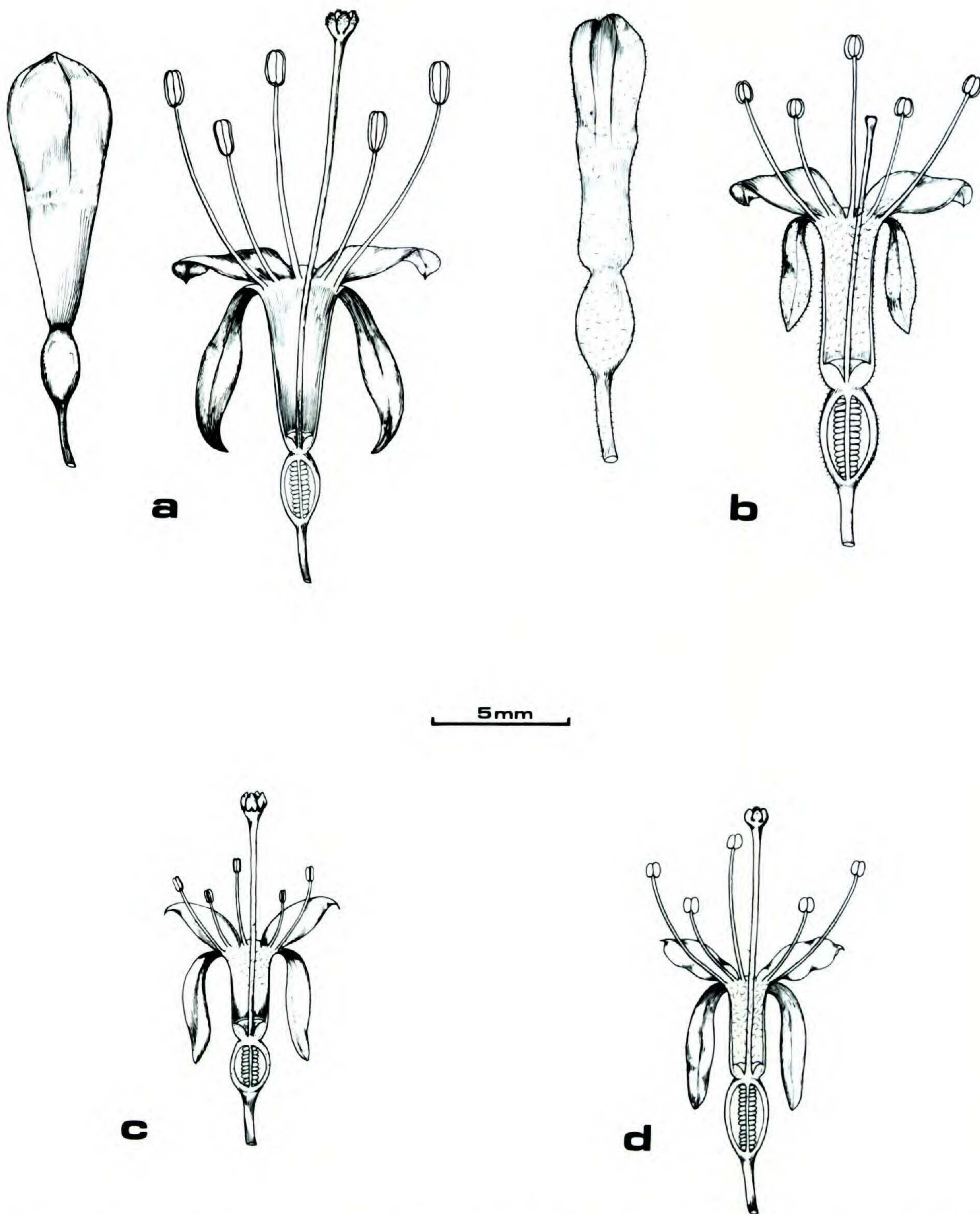


FIGURE 5. a. *Fuchsia arborescens* Sims. Bud and flower, longitudinal section. From *Feddema* 2872 (MO), Guerrero, Mexico. b–d. *Fuchsia paniculata* Lindley.—b. Bud and perfect flower, longitudinal section; from a gynodioecious population. From *Breedlove* 42742 (MO), Chiapas, Mexico.—c. Pistillate flower, longitudinal section. From *Raven* 20969 (DS), Cartago, Costa Rica.—d. Perfect flower, longitudinal section, from a hermaphroditic population. From *Ventura* 3631 (MO), Veracruz, Mexico.

quadrangular; older branches and main trunk 5–25 cm thick. Leaves opposite or 3–4-verticillate, firmly membranous to subcoriaceous, smooth, elliptic to oblanceolate or obovate, acute to narrowly cuneate at base, acute to acuminate at apex, 10–21 cm long, 4–8 cm wide, deep lustrous green above, paler below; margin entire; petiole 12–30 mm long; stipules broadly triangular, occasionally connate, 0.8–1.2 mm long, 1.0–1.5 mm wide, deciduous. Flowers erect and nu-

merous in terminal, di- to trichotomously branched panicles, 10–25 cm long, 9–20 cm wide; pedicels erect, slender, 9–18 mm long; floral tube subcylindric to obconic, 3.5–6 mm long, 1–1.5 mm wide at base, \pm enlarged around nectary, 2–4 mm wide at rim, usually glabrous inside and outside; flowers widened toward apex in bud; sepals oblong to lanceolate, acuminate, 4–11 mm long, 1.5–2.5 mm wide, spreading to reflexed at anthesis; tube and sepals rose-purple; petals lavender, lance-oblong to elliptic, 4–9 mm long, 1.5–3 mm wide, broadly acute at base, acute at apex, erect to spreading; nectary a smooth and irregularly lobed ring 1–1.6 mm high adnate to the base of the tube; antisepalous filaments 5–12 mm long, antipetalous ones 3–9 mm long, pink-purple; anthers oblong, 1.5–2.3 mm long, 1–1.5 mm thick; style 9–17 mm long, glabrous, pink, the stigma always exerted above the anthers, 1.5–3 mm wide, with 4 blunt lobes 1–2 mm long, lavender. Berry subglobose, 8–12 mm long, 7–10 mm thick, purple with a glaucous, waxy bloom when ripe; seeds 1–1.5 mm long, 0.5–0.8 mm thick. Gametic chromosome number, $n = 11$.

Distribution: Mexico. Occasional small trees mostly in barranca vegetation (moist ravines) of pine-oak forest in the Sierra Madre Occidental from Durango to Oaxaca and through the Trans-Mexican Volcanic Belt to Veracruz and then into northern Oaxaca, 1,750–2,500 m (Fig. 6). Flowering mostly in the dry season (December–May), but also well into the wet season.

Representative specimens examined: MEXICO, DURANGO: El Palmito, *Breedlove & Gregory 14250* (DS); ca. 8 km NE of Palmito, *Gentry & Gilly 10629* (MICH). GUERRERO: Filo del Caballo, *Breedlove 15832* (DS); Cruz de Ocote, 50–60 km W of Chilpancingo, *Feddema 2872* (DUKE, MICH, MO, PH); Campo Morado, Mina, *Hinton et al. 11173* (GH); Galeana, Toro Muerto, *Hinton 14213* (DS, F, GH, NA, NY, US); W of Cerro Azul, Mina, *Hinton et al. 14952* (GH); Milpillas-Ayotac road, ca. 24 km SW of Filo de Caballo, *Reveal et al. 4266* (MO); San Antonio-Buenos Aires, Montes de Oca, *Hinton et al. 14013* (GH, MICH, NA, NY, U); W of Petlacala, Mina, *Mexia 9052* (BH, G, GH, LL, MO, NY, S, U, UC); Omiltemi, W of Chilpancingo, *Rzedowski 15992* (MICH). JALISCO: W slopes of Sierra de San Sebastián, 15–30 km N of Mascota, *Anderson & Anderson 5659* (DUKE, MICH); ca. 24 km SW of Chante, Sierra Manantlán, *Gentry & Gentry 23514* (MICH); Sierra de Halo, *McVaugh & Koelz 1236* (MICH); 15 km SE of Autlán, trail from Chante to Rancho Manantlán, *McVaugh 10267* (DUKE, G, MICH, MO, TEX); Nevado de Colima, near Atenquique, *McVaugh et al. 11770* (MICH, RSA). MÉXICO: Tequexquipan, *Hinton 3520* (GH, MICH, NY, US); Rincón, Temascaltepec, *Hinton et al. 5287* (GH, NY, US); Cumbre of Cimientos, Temascaltepec, *Hinton et al. 8850* (GH); Cerro de Corona, Zacualpán, *Matuda 30739* (MEXU). MICHOACÁN: Coalcomán, Barroloso, *Hinton 15756* (DS, MICH, NY); ca. 28 km E of Morelia, *King & Soderstrom 5020* (MICH, NY, TEX, UC, US); Falls of Tzararacua, S of Uruapan, *Langman 3289* (NA, PH); Uruapan, *Leavenworth & Hoogstraal 1257* (F); Sierra de Manantlán, *McVaugh 13921* (MICH). MORELOS: Sierra de Morelos, *Hinton et al. 17096* (MICH); Tepoxtlán, *Miranda 517* (MEXU); Tlayacapan, *Paray 2109* (MEXU); mountains above Cuernavaca, *Pringle 6825* (BH, BM, BR, F, G, GH, K, LE, M, MICH, MO, NY, PH, POM, RSA, S, UC, VT, W, Z). OAXACA: Finca La Soledad, 184 km S of Oaxaca, *Alexander 587* (MEXU, MICH, NY, UC, US); near San Juan, *Arnold 3* (CAS); Coyula, Cuicatlán, *Cancino 2438* (US); Highway 175, 6 km S of Suchixtepec, *Croat 46026* (MO); Hacienda de San Luis, *González 426* (GH); Cañada de los Molinos, valley of Oaxaca, *Jurgensen 489* (BM, G); La Cumbre de los Molinos, *Karwinski? 46* (G); between Juquila and Nopala, *Nelson 2417* (US); Sierra de San Felipe, *Pringle 6242* (A, BH, BM, BR, F, G, GH, LE, M, MO, NY, PH, POM, RSA, S, UC, US, VT, W, Z); 4 km S of Lachao, Oaxaca-Puerto Escondido, *Rzedowski 19541* (MO). PUEBLA: San Vicente, near Puebla, *Nicolas in 1909* (G). VERACRUZ: Jalapa, *Galeotti 3035* (BR, LE, NY); La Luz, near Córdoba, *Kerber s.n.* (G); El Esquilón, municipio Jilotepec, *Ventura 4843* (MICH, MO).

Cultivated specimens: FRANCE: 1826 (G). GREAT BRITAIN: 1826, *Lindley 943* (CGE); Edinburgh, 1964, *Meyer 8211* (NA). INDIA: Madras, 1850, *Golley 389* (LE). MADEIRA: Santa Roque, *Hildebrand s.n.* (Z). MEXICO, VERACRUZ: Orizaba, 1885, *Gray s.n.* (GH). NETHERLANDS: Baarn, 1955, *Mennaga 4137* (BH, U). WEST GERMANY: Berlin, 1963, *R181* (B).



FIGURE 6. Distribution of *Fuchsia arborescens* and *F. paniculata* (sect. *Schufia*).

Fuchsia arborescens is commonly found in barrancas, or deep moist ravines, mostly in the Sierra Madre Occidental of Mexico. In "La Vegetación de Nueva Galicia," Rzedowski & McVaugh (1966) list *F. arborescens* as one of the low tree components of the "mesophytic mountain forest" formation, which occurs very discontinuously throughout the Sierra Madre and occupies less than 1% of the total vegetation cover for the area. This is the most moist formation of central, western Mexico, with rainfall estimated at 1,000–2,000 mm per year; the formation is essentially restricted to the barrancas, where a higher humidity can be maintained than in adjacent oak-pine forest. *Fuchsia fulgens* and *F. decidua* are listed as epiphytes in the same formation.

A diploid gametic chromosome count of $n = 11$ was obtained from *Breedlove 18713*. A somatic count of $2n = 22$ was obtained by D. Breedlove from a cultivated plant at Stanford University, California, grown from seeds collected at the University of Mexico Botanic Garden in Mexico City (no voucher). An additional diploid somatic count is cited by Kurabayashi et al. (1962) for *Raven 14745* (RSA).

6. *Fuchsia paniculata* Lindley, Gard. Chron. 1856:301. 1856. TYPE: Guatemala, 1855, *George U. Skinner 48* (CGE lectotype, here designated; photograph, MO).—FIGS. 5b, c, d.

Fuchsia arborescens auct. non Sims, 1825: Essig, Nat. Hort. Mag. 13:2, photo, 3. 1934; Munz in

Woodson & Schery, *Ann. Missouri Bot. Gard.* 45:218. 1959; Standl. & Williams, *Fieldiana, Bot.* 24(7):528. 1963.

Fuchsia arborescens var. *syringaeiflora* Lemaire, *Fl. Serres Jard. Eur.* 4:416, *fig.* 1848. TYPE: Cultivated in the garden of L. van Houtte, France, from seeds received in 1847 from Guatemala (K lectotype here designated); Sieb. & Voss. in *Vilm., Blemengart*, ed. 3, 1:332, *t.* 84. *fig.* 335. 1896.

Fuchsia syringaeiflora (Lem.) Carrière, *Rev. Hort.* 45:311, *fig.* 1873.

Fuchsia arborescens var. (?) *megalantha* Donnell Smith, *Bot. Gaz.* 18:2. 1893. TYPE: Volcán Acatenango, Dept. Sacatapéquez, Guatemala, Mar. 1892, *John Donnell Smith 4269* (US, holotype; GH, K, isotypes).

Fuchsia leibmannii H. Léveillé, *Bull. Geogr. Bot.* 22:24. 1912. TYPE: Volcan Irazú, ca. 2,800 m, Prov. San José, Costa Rica, 1845–1848, *A.S. Oersted 3297* (C, holotype; photograph, GH; G, isotype). Oersted, who collected in Costa Rica and Nicaragua from 1845 to 1848, and F. Liebmann, who collected in Mexico from 1840 to 1842, collaborated jointly on their collections upon their return to Europe. Léveillé mistook the type for a Liebmann collection, hence the specific epithet and the locality cited in the protologue as "Mexique: mont Frasu" (= Irazú).

Fuchsia arborescens forma *tenuis* Munz, *Proc. Calif. Acad. Sci.* IV. 25:86. 1943. TYPE: Vara Blanca de Sarapiquí, between Volcán Poás and Volcán Barba, 1,740 m, Prov. Heredia, Costa Rica, Oct., 1937, *Alexander Skutch 3357* (US, holotype; A, MO, NY, S, isotypes).

Fuchsia arborescens forma *parva* Munz, *Proc. Calif. Acad. Sci.* IV. 25:86. 1943. TYPE: Finca Pirineos, below Santa María de Jesús, Dept. Quezaltenango, Guatemala, *Paul Standley 68287* (POM, holotype; F, isotype).

Gynodioecious or subdioecious. Erect woody shrubs or small trees 3–8 m tall, usually glabrous. Branchlets ascending, 1–4 dm long, 2–5 m thick, subtriangular to quadrangular; older branches and main trunk 2–15 cm thick. Leaves opposite or 3–4-verticillate, subcoriaceous, elliptic to oblanceolate, acute to narrowly cuneate at base, acute to acuminate at apex, 5–15.5 cm long, 2–5.5 cm wide, deep lustrous green above, paler below; margin minutely to coarsely serrate; petiole 8–26 mm long; stipules triangular, often connate, 0.8–1.2 mm long, 0.7–1.5 mm wide, deciduous. Flowers erect and numerous in terminal, di- to trichotomously branched panicles, 10–14 cm long, 9–12 cm wide, narrowed towards the apex. *Perfect flowers*: Pedicels slender, 8–12 mm long; floral tube cylindrical to subobconic, 4–8 mm long, 1–2 mm wide at base, 1.5–3 mm wide at the rim, often pilose within; sepals lanceolate, 5–10 mm long, 1.1–2.5 mm wide, spreading to reflexed at anthesis; tube and sepals rose-purple; petals lavender, lanceolate to elliptic, 4–10 mm long, 1.1–3.5 mm wide, acute at both ends, erect to spreading; nectary smooth to irregularly lobed ring 1.3–2 mm high adnate to the base of the tube; antisepalous filaments 4–13 mm long, antipetalous ones 2–11 mm long, pink; anthers broadly ovoid to reniform, 0.8–1.6(–2) mm long, 0.7–1.4 mm thick; style sparsely pilose, either exerted beyond anthers with a shortly 4-lobed stigma or included below the anthers and the stigma strongly reduced, lavender. *Pistillate flowers*: Similar to the perfect ones except in the following characters: floral tube smaller, 3–5.5 mm long, 0.7–1.7 mm wide at base, 1.5–2.2 mm wide at rim; sepals 3.5–7 mm long, 0.7–1.3 mm wide; petals 2.3–4.5 mm long, 0.6–1.3 mm wide; nectary 0.8–1.4 mm high; antisepalous filaments 1.5–4.9 mm long, antipetalous ones 1.0–3.9 mm long; anthers abortive, 0.4–0.8 mm long, 0.2–0.6 mm thick; style stout, 7–11 mm long, the stigma well exerted above the stamens, 4-lobed, lobes 0.6–1.9 mm long. Berry subglobose, 4–9 mm long, 4–7 mm thick, purple with a glaucous, waxy bloom; seeds 1–1.4 mm long, 0.5–0.8 mm thick. Gametic chromosome number, $n = 11$.

Distribution: Mexico to Panama. Frequent in moist oak-pine and evergreen

cloud forest from Veracruz, Mexico south to central Panama. North of the Isthmus of Tehuantepec, it occurs only on the wet Caribbean facing-slopes in Puebla, Veracruz, and Oaxaca. This species grows at elevations of (800–)1,200–3,000 m (Fig. 6). Flowering throughout the year.

Representative specimens examined: MEXICO, CHIAPAS: Zinacantán, NW of Navenchauc, *Breedlove* 5971 (DS); Chamula, *Breedlove* 7145 (DS); Rayón, N of Pueblo Nuevo, near Puerto el Viento, *Breedlove* 10172 (DS, BM); Huistán, *Breedlove* 7343 (BM); N & W slopes of Cerro Mozotal, road Huixtla-El Porvenir, *Breedlove & Smith* 22793 (MO); Cerro Huitepec, W of San Cristóbal las Casas, *Breedlove* 23007 (MO); 16 km NW of Rizo de Oro, SE of Cerro Baúl, *Breedlove* 24891 (MO); SE slopes of Volcán Tacaná, above Talquián, *Breedlove* 29475 (MO); near summit of Chuchil Ton, NE of Bochil, *Breedlove* 34657 (MO); Laguna Pojo, near Lago Tsiskla, *Breedlove* 37087 (MO); logging road, Las Margaritas-Campo Alegre, *Breedlove* 41114 (MO); near Niquivil, junction of ridge to Cerro Boquerón, *Breedlove* 42742 (MO); 4 km N of Colonia San José, ca. 12 km S of Layón, *Hansen et al.* 1688 (MICH); San Bartolo, *Linden* 39 (G); Mt. Ovando, *Matuda* 437 (F, MEXU, MICH, US); Siltepec, *Matuda* 812 (MEXU, MICH); Mt. Pasitar, *Matuda* 1695 (A, MEXU, MICH, NY); Volcán Tacaná west, *Matuda* 2924 (A, LL, IPN, MICH); Mt. Pale, near Porvenir, *Matuda* 4670 (A); near Motozintla, *Matuda* 15447 (LL, MEXU, TEX); Cerro del Boquerón, *Purpus* 6970 (GH, MO, NY, UC, US); near Pueblo Nuevo Solistahuacán, *Raven & Breedlove* 20004 (DS, GH); Jitotal, *Roe et al.* 1182 (MICH). OAXACA: Cuyamecalco, Cuicatlán, *Conzatti* 3497 (MEXU); ca. 60 km N of Ixtlán de Juárez, road to Tuxtepec, *Denton* 1688 (MICH); Tonaguía, *Galeotti* 3035 (LE, W); Nolasco, *Galeotti* 3058K (F); Rt. 175 near Cerro Pelón, 34 km SW of Valle Nacional, *Hill* 1730 (MO); Monte Tepitongo, Sierra San Pedro Nolasco, Talea, *Jurgensen* 530 (G); Vista Hermosa to Comaltepec, *Martínez* 242 (MO); ca. km 125 of Tuxtepec-Oaxaca road, *Smith & Tejeda* 4497 (NA); ca. 16 km S of Villa Hermosa, *Torke et al.* 504 (MO). PUEBLA: Road to Presa de Apulo, N of Oriental-Tezuitlán road, *Koch & Fryxell* 7716 (MO); NE of Tezuitlán, *Pineda* 686 (MICH); San Juan Abuacatlán, *Salazar s.n.* (MEXU); Colihuit, municipio Hueytamalco, *Ventura* 389 (MICH); Agua de Obispo, municipio Tezuitlán, *Ventura* 13641 (MO); ca. 8 km NE of Teziutlán, road to Tlapacoyán, *Webster & Breckon* 15463 (DUKE, GH). VERACRUZ: Orizaba, *Botteri* 58 (F, GH); Jalapa, *Galeotti* 3035 (G); Cerro de San Cristobal, W of Orizaba, *Langman* 3587 (PH); Mirador, *Liebmann* 3237 (BH, BR, G, GH, MO, MSC, UC, US); Huahesco, *Mohr* 1865 (US); Zacuapan, Tenampa, *Purpus* 4330 (A, BM, GH, MO, UC); Chiconquiaco, cañada del Huérfano, *Rosas* 580 (MO); Ahuacatlán, municipio Jalacingo, *Ventura* 283 (MICH, MO); Lomas de Santa Rita, municipio Yecualta, *Ventura* 3631 (MO); Xico, *Ventura* 4519 (MICH); Tepezingo, *Ventura* 15051 (MO); Cuesta Grande de Jalacingo, *Schiede & Deppe* 526 (LE, W). GUATEMALA, ALTA VERAPAZ: Chucaneb, *Donnell Smith* 182 (G, GH, PH); Tactic, *von Tuerckheim* 8395 (A, F, M, NY, US); Cobán, *von Tuerckheim* 11713 (BR, C, F, FI, G, GH, LE, MO, US, W, Z). BAJA VERAPAZ: Unión Barrios, *Contreras* 11245 (MO); ca. 7 km NE of Purulhá, *Croat* 41329 (MO). CHIMALTENANGO: Tres Cruces, N side of Volcán Acatenango, *Beaman* 3996 (GH); Volcán Acatenango, *Hunnewell* 14764 (GH); Chichavac, *Skutch* 255 (US); Las Calderas, Volcán Acatenango, *Standley* 61962 (F); Patzum, *Williams & Molina* 11843 (F, GH); road to Panajachel, between Los Idolos and Chochoyos, *Williams* 16214 (F). CHIQUIMULA: Concepción de las Minas, Montaña Norte, *Steyermark* 31042 (F). ESCUINTLA: S slopes of Volcán de Agua, *Almeda* 756 (DUKE). GUATEMALA: 6 km SE of Guatemala City, *Harmon* 1980 (MO); below San Lucas and Guatemala City, *Molina et al.* 16662 (F). HUEHUE-TENANGO: Sierra de los Cuchumatanes, San Mateo Ixtatán, *Breedlove* 11636 (DS); Jacaltenango, *Seler & Seler* 2599 (GH); Yalambo, *Seler & Seler* 2869 (GH, US). QUEZALTENANGO: road to Fuentes Georginas, *Boeke* 164 (MO); 3 km S of Santa María Electric Plant, *Roe et al.* 718 (G); Volcán Zunil, *Skutch* 877 (A); above Mujulía, *Standley* 85487 (F); Montaña Chicharro, lower SE slopes of Volcán Santa María, *Steyermark* 34282 (A, F). QUICHÉ: Nebaj, *Contreras* 5083 (LL); San Miguel Uspantán, *Heyde & Lux* 3001 (G, GH, M, MO, NY, POM, US); RETALHULEU: Finca Helvetias, *Muenschel* 12430 (BH). SACATEPÉQUEZ: Volcán Acatenango, *Donnell Smith* 2469 (GH, US); Volcán de Fuego, *Salvin s.n.* (W); Santa María de Jesús, Volcán de Agua, *Standley* 65006 (F). SAN MARCOS: La Trinidad, above San Rafael, *Croat* 40881 (MO); 22 km W of San Marcos, *Harmon & Fuentes* 4744 (MO); Volcán Tacaná, San Rafael, *Steyermark* 36331 (F, POM); Finca El Porvenir, *White* 5421 (MO); ca. 15 km W of San Marcos slopes of Cerro Tumbador, *Williams et al.* 23061 (F, G); near Alta Fraternidad, between San Rafael Pie de la Cuesta and Palo Gordo, *Williams et al.* 27163 (F). SOLALÁ: 2 km W of Godinez, *Harmon & Dwyer* 2624 (GH, MO); above Lake Atitlán, W of Panajachel, *Williams et al.* 25347 (F). SUCHITEPÉQUEZ: S slope of Volcán Atitlán, *Hatch & Wilson* 361 (BH, F); Finca Mocá, *Skutch* 1552 (A, F). ZACAPÁ Sierra de las Minas, Finca Planados, *Steyermark* 29996 (F); Volcán de Monos, *Steyermark* 42382 (BH, F). EL SALVADOR, CHALATENANGO: E slopes of Los Esemiles, *Tucker* 1006 (BG, G, LL, MICH, NY, P, PH, UC, US). SANTA ANA: Volcán Santa Ana, *Carlson* 698 (A, F, MO, UC); Cerro Miramundo, *Carlson* 987 (F); Cerro Montecristo, 24 km NE of Metapán, *Croat* 42341 (MO). HONDURAS, CORTÉS: Montaña San Idalfonso, *Molina* 11462 (F). EL PARAÍSO: Mon-

taña de Yuscarán, *Rodríguez 1956* (F); El Volcán, *Williams & Molina 12187* (F, GH, MICH, MO). FRANCISCO MORAZÁN: Mt. Uyuca, near Zamorano, *Carlson 2459* (GH); 6 km N of Tegucigalpa, *Clewell 3016* (MO); Mt. San Juancito, *Williams & Molina 12752* (F, GH); Montaña La Tigra, ca. 15 km NW of Tegucigalpa, *Williams et al. 23266* (BM, F, G, GH, LL, MICH, NY, UC, US, W). INTIBUCA: near La Esperanza, *Hazlett 1244* (MO); Cordillera de Opalaca, Calaveras, *Molina 6434* (US). LA PAZ: Sabanetas, Cordillera Guajiquiro, *Molina & Molina 13918* (F); Montaña Verde, Cordillera Guajiquiro, *Molina 24392* (F). OCOTEPEQUE: 2 km E of Continental Divide on road between Nueva Ocotepeque and Santa Rosa de Copán, *Harmon & Dwyer 4104* (GH, MO); Mt. Cocal, Cordillera Merendón, 20 km W of Ocotepeque, *Molina 2214* (F); El Portillo, Cordillera Merendón, 20 km E of Nueva Ocotepeque, *Molina et al. 31353* (MO). NICARAGUA, JINOTEGA: Cordillera Isabela, Macizos de Peñas Blancas, *Grant 7334* (A, F); Hwy 3, ca. 2 km NW of Aranjuez road, *Stevens 9186* (MO); ca. 8 km S of Jinotega, *Wilbur & Almeda 16510* (DUKE, MO). MATAGALPA: between Jinotega and Matagalpa, *Bunting & Licht 983* (DUKE, F); Santa María de Ostuma, *Williams et al. 23422* (F, G, W); road to La Fundadora, N of Santa María de Ostuma, *Williams et al. 24955* (F, G); near Xelaju, *Williams et al. 29239* (GH). COSTA RICA, ALAJUELA: Highway 120 to Volcán Poás, 1.5–3 km from the crater, *Almeda 382* (DUKE); Palmira del Naranjo, *Brenes 3521* (F, NY); ca. 12 km N of Carrizal, between Volcán Poás and Volcán Barba, *Croat 35464* (MO); Zarcero, Palmira, *Jiménez 2567* (F); Palmira, *Smith 2145* (A, NA); Volcán Poás, *Smith 6504* (GH, POM, US). CARTAGO: 20 km SE of Empalme, *Burger & Stolze 5237* (DUKE, F); near Volcán Irazú, *Carlson 3581* (F, GH, S); Trinidad to Volcán Turrialba, *Lent 722* (MO); Río Tiribí, road from Ipis to Tierra Blanca, *Lellinger & White 993* (F, MICH, MO); Volcán Turrialba, *Pittier 7508* (F, MO, US); 1 km above El Empalme, *Raven 20969* (DS); below San José de Chicua, road to Volcán Irazú, *Raven 20974* (DS); Cerro Guardián, S slope of Irazú, *Webster et al. 12143* (F); ca. 4 km NE of Pacayas towards Santa Cruz de Tenerife, *Wilbur & Luteyn 13890* (F, GH, MO); ca. 4 km E of Rancho Redondo, SW flank of Volcán Irazú, *Wilbur 14273* (DUKE, MO); between Hacienda Central and Finca Quemado, *Wilbur 14339* (DUKE). GUANACASTE: ca. 7 km NE of San Vicente, above Cascajal, *Wilbur & Almeda 16720* (DUKE). HEREDIA: Vara Blanca intersection, trail to Volcán Poás, *Almeda et al. 2198* (DUKE); Porrosatí, N of Barba, *Crosby & Crosby 6611* (MO); Los Cartagos, Volcán Poás road, *Raven 20980* (DS, GH); Vara Blanca de Sarapiquí, *Skutch 3357* (A, G, MO); Volcán Barba Massif, *Tonduz 1734* (W); San Rafael, E of Vara Blanca, *Utley & Utley 4169* (MO); Volcán Barba, *Wilbur & Teeri 13679* (DUKE, F, GH, MICH, MO). SAN JOSÉ: Las Nubes, *Allen 713* (A, MO); Abra, Chirripó Massif, *Davidse & Pohl 1534* (MO); between Guayabillos and Cabeza de Vaca, *Dodge & Thomas 4936* (GH, MO); Randho Redondo, *Dodge & Thomas s.n.* (MO); Cerro de la Muerte to San Isidro del General, *Lewis 5047* (DUKE); 5 km N of Santa María de Dota, *Lent 3910* (MO); ca. 6 km N of Copey, *Little 6016* (A, MO); El Empalme, *Stork 4545* (MICH, UC); La Palma, *Tonduz 7410* (BM, F, GH, MO, POM, US); Copey, *Tonduz 11666* (G, GH, W); ca. 7 km NE of San Vicente, above Cascajal, *Wilbur & Almeda 16720* (DUKE); above Quebrada Varela, E of San Isidro, *Wilbur & Luteyn 18177* (DUKE). PANAMA, CHIRIQUÍ: Nueva Suiza, *Allen 1351* (GH, MO); Cerro Punta, *Allen 3505* (BM, G, GH, MO, S, U); Finca Arco Iris, Boquete to Palo Alto, *Béliz 210* (MO); 2 km towards Cerro de la Muerte, *Correa 1256* (COL, DUKE, MO); between Alto de Guayabo and continental divide, *Correa et al. 2821* (MO); Monte Rey, above Boquete, *Croat 15772* (MO); above Guadalupe, *Croat & Porter 16021* (MO); La Cumbres, near Cerro Punta, *Croat & Porter 16136* (MO); Cerro Azul, E of Boquete, *Croat 26838* (MO); N of San Félix, near Chiriquí-Bocas del Toro border on road to Cerro Colorado, *Croat 33485* (MO); La Popa, above Boquete, *D'Arcy & D'Arcy 6356* (MO); Alto Respinga, *D'Arcy 9950* (MO); valley of Río Viejo, N of Volcán City, *Duke 8997* (MO); Cerro Horqueta, *Duke et al. 13633* (DUKE, MO); Finca Collins, *Ebinge 689* (MO); Cerro Punta to Las Nubes, *Hammel 1371* (MO); N slope of Volcán Barú, E of Bajo Chorro, *Hammel 2992* (MO); Cerro Hornito, *Hammel 3052* (MO); Las Nubes, *Liesner 289* (GH, MO); 8–15 km from Hato de Volcán, *Luteyn 844* (DUKE); Alto Quiel to Bajo Mono, *Luteyn 3708* (DUKE); Bajo Grande to Cerro Punta, *Nee 9973* (GH, MO); upper Río Chiriquí Viejo, vicinity of Monte Lirio, *Seibert 246* (MO); Volcán Barú, near Cerro Punta, *Stern & Chambers 86* (A, MO); El Volcán, *White 4* (GH, MO); Bajo Quiel to Bajo Mono, *Wilbur et al. 11992* (DUKE); S slopes of Cerro Horqueta, N of Boquete, *Wilbur et al. 13443* (DUKE); Casita Alta, Volcán de Chiriquí, *Woodson et al. 797* (A, MO, NY, POM). PANAMÁ: Cerro Jefe, 15–20 km beyond Goofy Lake (Lago Cerro Azul), *Duke 8029* (MO).

Naturalized specimens: COLOMBIA, CUNDINAMARCA: Nemocón, between road and railroad tracks, *García Barriga 19387* (COL, US). BOYACÁ: Labranzagrande, *Guevara 389* (US). SRI LANKA: Nuwara Eliya to Hakgala, just beyond pass to Nuwara Eliya, Rte. A-5, *Read & Desautels 2278* (MO). TANZANIA: Kiefingelo, W of Usumbara, *Greenway 5896* (FHO, K). UNITED STATES, HAWAII: bulldozed Kilauea Forest Reserve, Hawaii, *Degener & Degener 31130* (A, B, NA, Z); ravines over lava, Oahu, *Leith et al. s.n.* (MO).

Cultivated specimens: COLOMBIA, CUNDINAMARCA: Bogotá, *Duque-Jaramillo 2970* (COL, NY). FRANCE: Van Houtte nurseries, 1849 (K). KENYA: Nairobi, 1973, *Raven 26162* (MO). NEW ZEALAND:

Whangarei, originally brought from Tahiti, *Engelhorn s.n.* (MO). ZIMBABWE: Salisbury, *Biegel 4406* (NA). SRI LANKA: Hangola Garden, *Marcovitz in 1927* (LE). UNITED STATES, CALIFORNIA: Santa Barbara, 1970, *Hall 7736* (UC); Berkeley, *Raven 49.801* (DS); Los Angeles, 1901, *Braunton s.n.* (BH). MASSACHUSETTS: Harvard University, Boston, 1876 (GH). HAWAII: "29 Miles," Volcano, Hawaii, *Degener & Degener 31131* (B, MO).

Fuchsia paniculata has leaves with minutely to coarsely serrate margins and a ridged surface; its flowers are consistently more slender and generally smaller than those of *F. arborescens*, but they are much more variable. Apparently all populations of *F. paniculata* north of the Isthmus of Tehuantepec consist entirely of hermaphroditic plants; the flowers are more or less uniform, with small (less than 1 mm long), reniform anthers, and exserted, moderately four-lobed stigmas (Fig. 5d). The populations south of the Isthmus of Tehuantepec, however, are morphologically gynodioecious with perfect flower morphs of different populations varying in style, length, and stigma size. The perfect flowers of these southern populations of *F. paniculata* vary from the type just described for the populations north of Tehuantepec to flowers with very small stigmas held well below the stamens on a short, slender style (Fig. 5b and c).

Field observations were made on several populations of *Fuchsia paniculata* in Costa Rica by Arthur Weston in April, 1971. At one locality in Prov. Cartago, between El Empalme and La Trinidad, a random selection of the population yielded 11 pistillate and 15 perfect-flowered plants. All perfect-flowered plants were found to be functionally staminate, because no developing fruits could be found on them. This agrees with observations in Chiriquí Province of Panama by Woodson & Seibert (1937, p. 196). Examination of herbarium specimens of perfect-flowered individuals from Panama and Costa Rica do show, however, a number of collections with some ripe or developing fruits, for example, *Hammel 3052* (MO) and *Wilbur et al. 13443* (DUKE). In general, however, far fewer fruits are produced on perfect-flowered plants than on pistillate plants in the populations south of the Isthmus of Tehuantepec, and this can be seen easily both in the field and on herbarium specimens. In addition, fewer seeds apparently develop in fruits of the perfect-flowered plants. The perfect flowers are thus largely female-sterile, and the populations south of the Isthmus of Tehuantepec are consequently subdioecious like the three morphologically gynodioecious species of sect. *Encliandra* (Arroyo & Raven, 1975).

Perfect-flowered plants with small stigmas and short styles, raised at the Missouri Botanical Garden from seed of *Breedlove 42742* (MO) from Chiapas, Mexico, regularly produced moderate numbers of selfed fruits with viable seeds. Some of these seeds were raised until flowering, yielding 9 hermaphroditic and 4 pistillate individuals. Although the sample size was quite small, this does indicate that male sterility in *F. paniculata* is not controlled by a dominant gene, as seems to be the case in sect. *Encliandra* (Arroyo & Raven, 1975). The male sterility in sect. *Schufia* may therefore be more similar to that found in the unrelated sect. *Skinnera*, in which it is controlled by a recessive gene (Arroyo & Raven, 1975).

The incomplete female sterility in the perfect-flowered plants of *Fuchsia paniculata* south of the Isthmus of Tehuantepec, the presence of only hermaphroditic populations of the same species north of Tehuantepec, and the presence of an entirely hermaphroditic, closely related species, *F. arborescens*, clearly represents a dynamically evolving progression from hermaphroditic to dioecious plants,

where first male sterility, then female sterility, have been selected to promote increased outcrossing.

Diploid gametic chromosome counts of $n = 11$ were obtained from the following collections of *Fuchsia paniculata*: *Breedlove 5971, 7343, and Raven 20995*. In addition, a count of $n = 11$ with normal meiotic pairing was obtained from an experimental cross between two different populations of *F. paniculata*, one from Oaxaca (*Hill 1730, MO*) and the other from Costa Rica (L. Fournier, El Empalme, Cartago; no voucher).

Fuchsia sect. **Fuchsia**. TYPE: *Fuchsia triphylla* L. *Eufuchsia* Baillon, Hist. Pl. 6: 467. 1877, as section. Munz, Proc. Calif. Acad. Sci. IV. 25:15. 1943.

Hermaphroditic. Erect, scandent, or climbing shrubs. Leaves opposite or whorled. Flowers generally pendant; axillary, racemose, or paniculate. Floral tube usually longer than sepals. Petals usually more than $\frac{1}{2}$ the length of the sepals and generally not convolute at anthesis. Nectary annular, surrounding the style and free from the tube except for the basal $\frac{1}{2}$ or less, rarely fully adnate to the floral tube. Stamens biseriate, shorter than the sepals or exerted less than 5 mm beyond them, the antisepalous stamens longer than the antipetalous stamens. Berry with ca. 50–ca. 200 seeds, these compressed laterally, irregularly triangular or obovate in outline, 1–2.5 mm long, 0.7–1.9 mm wide. Gametic chromosome numbers, $n = 11, 22$.

7. **Fuchsia boliviana** Carrière, Rev. Hort. 48:150, *pl.* 1876. TYPE: *Plate* in Carr., Rev. Hort. 48:150. 1876. Lectotype here designated. The plant illustrated is from garden material cultivated in France, ca. 1876, from seeds collected in the mountains of Bolivia in 1873 by Benedict Roezl. For full synonymy see Berry (1982).

Fuchsia corymbiflora auct. mult., non Ruiz & Pavón. 1802.

Erect, openly-branched shrubs 1.5–4(–6) m tall. Branchlets ascending at base, nodding towards apex, 1–4 dm long, 3–7 mm thick, terete to angled, densely tomentose; older branches and trunks 1–5 cm thick. Leaves opposite, sometimes alternate or ternate, soft-membranous, elliptic to ovate, rounded to acute at base, acute to acuminate at apex, 5–20(–23) cm long, 3–12(–15) cm wide, dark matte green above, paler below, soft pubescent on both surfaces; margin denticulate with numerous glandular teeth; petioles pubescent, 2–5(–7) cm long, stipules dark, filiform, 1–2 mm long, ca. 0.3 mm wide, deciduous. Flowers numerous in terminal, drooping racemes or few-branched panicles, the flowers congested toward the tip; rachis 5–40(–60) cm long; bracts reflexed, lanceolate, 5–25 mm long; pedicels slender, 5–16 mm long; floral tube narrowly funnelform, 30–60(–70) mm long, 1.5–3 mm wide at base, gradually widened above until 5–8 mm wide at rim, pubescent outside, pilose inside; sepals lanceolate, acuminate, 10–20 mm long, 4–5 mm wide, initially spreading but soon becoming fully reflexed, the tips connivent in bud; tube and sepals pale pink to usually bright scarlet; petals red, oblong to lanceolate, acute at apex, 8–16(–20) mm long, 3–7(–9) mm wide, \pm crispate with 2–3 longitudinal ridges; petals shrivel and fall off before tube dehisces; nectary annular, 4-lobed, 2–4 mm high, mostly free from the tube; fila-

ments red, the antisepalous filaments 8–15 mm long, the antipetalous filaments 5–10 mm long; anthers oblong, 2–3.5 mm long, 1–1.5 mm thick, white; style red, pubescent, the stigma capitate, subtetragonous, 2–3.5 mm long, 3–5 mm wide, 4-parted at apex, cream. Berry ellipsoid to cylindrical, 10–25 mm long, 8–14 mm thick, dark purple, comestible; seeds tan, 1.5–2.0 mm long, 0.5–1.0 mm thick. Gametic chromosome number, $n = 11$.

Distribution: Escaped from cultivation and locally established on moist slopes from Puebla south to Costa Rica, always near habitations. (Native to southern Peru, Bolivia, and northern Argentina.) Flowering throughout the year.

Specimens examined (both naturalized and cultivated): MEXICO, CHIAPAS: Piedracitos, Chamula, *Breedlove 8018* (DS). DISTRITO FEDERAL: Villa Obregón, *Moore 6395* (BH); Coyoacán, *Woronow 2065* (LE). PUEBLA: Huauchinango, *Baldwin 14390* (LL). VERACRUZ: Orizaba, *Botteri 929* (LE); Jalacingo, *Dodds 57* (MO); Altotonga, *Foster in 1938* (BH, BM); Santa Ana Atzacán, N of Orizaba, *Rosas 191* (MO); Santa Cruz, Altotonga, *Ventura 1026* (CAS). GUATEMALA, SACATEPÉQUEZ: San Rafael, *Donnell Smith 2176* (K, US); Antigua, *Standley 62331* (F). SAN MARCOS: Tajumulco, Volcán Tajumulco, *Johnston 1231* (F), *Steyermark 36510* (F). EL SALVADOR: Volcán de San Salvador, *Calderón 2345* (F, US). COSTA RICA, ALAJUELA: Zarco, *A. Smith 2775* (F). CARTAGO: Cartago, *Donnell Smith 4804* (US). SAN JOSÉ: San José, *Pittier 14104* (CM, GH, U, US); Guadalupe, *Quiros 1289* (F).

Fuchsia boliviana is perhaps the most widely naturalized species in the genus, at least in tropical and subtropical areas. Outside of its probable native range of southern Peru to northern Argentina, it is also naturalized in Colombia, Venezuela, Jamaica, Hawaii, Java, Réunion, India, and a number of other countries. A single introduced plant can give rise to extensive local populations, because it self-pollinates very effectively and also reproduces vegetatively by stem shoots. Its striking drooping terminal racemes stay in flower through the year, and it is tolerant of much drier and harsher conditions than most species in the genus. For these reasons, *F. boliviana* is a frequently cultivated and escaped shrub in many villages throughout Central America and Mexico. A diploid gametic chromosome count of $n = 11$ was obtained from *Breedlove 8018* (DS).

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APPENDIX

Fuchsia hybrida Hort. ex Sieb. & Voss. in Vilm, *Blumengart.* 3, 1:332. 1896.

Specimens examined (presumed cultivated): MEXICO, HIDALGO: Real del Monte, *Salazar s.n.* (MEXU). MICHOACÁN: Hacienda Coahuayula, *Emrick 204* (F). PUEBLA: San Pedro, *Nicolas s.n.* (NY). VERACRUZ: Jalapa, *Calzada 2086* (MO); Altotonga, *Dodds 41* (MICH); La Orduña, Municipio Coatepec, *Jiménez 70* (MO); Congregación Dos Pocitos, Municipio Tonayán, *Márquez et al. 456* (MO), *457* (MO), *459* (MO); Casa Quemada, Km 36 of Teocelo road, Cosautlán, *Márquez et al. 965* (MO); Zoncuantla (La Pitaya), Municipio Coatepec, *Murrieta 103* (MO). GUATEMALA, ALTA VERAPAZ: Vicinity of Cobán, *Standley 91231* (F), *92468* (F). GUATEMALA: without locality, *Aguilar 125* (F), *171* (F), *173* (F). HUEHUETENANGO: Wahshaklahung Pyramid, San Mateo Ixtatán, *Breedlove 8658* (DS). SACATEPÉQUEZ: Antigua, *Standley 63836* (F). COSTA RICA, SAN JOSÉ: San José, *Umaña 20* (F).

Fuchsia magellanica Lamarck, *Encyc.* 2:565. 1788.

Specimens examined (presumed cultivated): MEXICO, PUEBLA: *Arsène s.n.* (US). SAN LUIS POTOSÍ: San Luis Potosí, *Schauffeur in 1879* (A). PANAMA, CHIRIQUÍ: Boquete, *Dwyer 7022* (MO).

THE DENNIS STANFIELD AWARD

The Dennis Stanfield Memorial Fund has been established to assist persons of scientific merit to undertake botanical research on tropical African plants. Awards were made in 1974, 1977, and 1980, and the award in 1983 will be £250. Application forms should be obtained from the Executive Secretary of the Linnean Society of London, Burlington House, Piccadilly, London W1V 0LQ, United Kingdom, and should be returned to the same address by 31st March 1983. The award is to be used for such items as travel, equipment, books, computing time, research expenses, and the like, in connection with any aspects of botanical research. The award is open both to amateurs and professionals.

THE 1982 JESSE M. GREENMAN AWARD

The 1982 Jesse M. Greenman Award has been won by Walter S. Judd for his publication "A monograph of *Lyonia* (Ericaceae)" (*Jour. Arnold Arbor.* 62:63–209; 315–436). This monographic study is based on a Ph.D. Dissertation from the Department of Biology, Harvard University.

The Greenman Award, a cash prize of \$250, is presented each year by the Missouri Botanical Garden. It recognizes the paper judged best in vascular plant or bryophyte systematics based on a doctoral dissertation that was published during the *previous* year. Papers published during 1982 are now being considered for the 16th annual award, which will be presented in the summer of 1983. Reprints of such papers should be sent to: Greenman Award Committee, Department of Botany, Missouri Botanical Garden, P.O. Box 299, St. Louis, MO 63166-0299, U.S.A. In order to be considered for the 1983 award, reprints must be received by 1 July 1983.